EMERGING TECHNOLOGY GROUP

THE STATE OF TECHNOLOGY AND DIPLOMACY

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EXECUTIVE SUMMARY

This paper explores the state of technology in peacekeeping applications while proposing solutions to persisting gaps. These gaps include those related to a lack of efficient negotiations, information transparency in monitoring, remedial efforts for those affected, and bridges for stakeholders in these efforts, with streamlined communication pipelines.

Firstly, on the negotiation side, artificial intelligence has proven valuable through automating data collection and providing decision-makers with informed strategic choices based on historical actions. Data-driven reason is facilitated by algorithms that help stakeholders find areas of mutual agreement by adjusting user intent in real time and identifying common ground, which then inform optimal strategies for cooperation, negotiation, and coordination. Secondly, early warning systems in monitoring are crucial in peacekeeping, empowered by various technologies ranging from sensor networks to satellite imagery. Machine learning algorithms can then use this information to predict probabilities of attacks or violence, saving lives and optimizing troop placements at the same time. Thirdly, increased connectivity as well as better aid monitoring and distribution has led to great strides in the remediation. These are powered by technologies such as digital IDs and unmanned aerial vehicles for restorative justice, while the punitive side leverages technologies to expose crimes, ranging from satellite imagery to open-source intelligence groups. At the same time, this genre of humanitarian tech is contingent on collaborations between private and public sectors and their discussions on addressing ethical, regulatory, and security-based concerns. Digital inclusion and collaboration between cross-stakeholder groups are essential considerations for all of the above; data sharing, trust building, and collaboration-based software aligned with end-user needs are vital principles. Though digital trust varies across regions, emphasizing a common thread of needs for a secure and trustworthy digital environment will foster sustainable progress for peacebuilding.

Based on these recent innovations, the paper also provides actionable recommendations for the State Department and relevant stakeholders to leverage these technologies with a human-centered approach. These recommendations specify best practices for leveraging AI models in data collection to ensure a robust set of training data that is continuously fine-tuned as well as establishing virtual collaboration tools and project management software to centralize relevant documents, research findings for easy real-time collaboration. Furthermore, we recommend machine learning applications through investments in risk mapping and alert systems for predictive peacekeeping, while setting up blockchain infrastructure for verification of digital evidence, transparency for maintained records, along with other cybersecurity principles. On a more holistic level, this paper identifies relevant partners in the private sector for relief efforts and promoting public investment in emerging technologies. Models include the Office of the Special Envoy for Critical and Emerging Technology, a forum to coordinate

private-sector investments, and enhanced coordination between the State Department and peacekeeping organizations.

INTRODUCTION

The current state of diplomacy is characterized by a rapidly changing global landscape connected by a complex set of relationships. Pressing challenges ranging from socioeconomic disparities to geopolitical tensions to climate change persist. Though diplomatic efforts have been focused on multilateral cooperation and consensus-building to address these issues, nations continue to grapple with them. This is exacerbated by the onset of trade disputes, territorial conflicts, and even the most fundamental ideological confrontations. International organizations and government entities play a crucial role in facilitating dialogue. Likewise, technological advancements present opportunities for effective cooperation.

Negotiations have fundamentally been the first step in approaching topics of polarization. They are essential not only to bring conflicting groups together in a constructive and tension-reducing manner but also to identify underlying causes, and initiate actionable insights moving forward. Providing a forum for open and honest communication tends to lead to a mutually acceptable solution. Sustainable and lasting peace has negotiations as basic prerequisites, especially in the political climate today. Though these negotiations seem to be associated with a human element at least in their execution, the current state of global affairs and its sensitivity to precision necessitate some technological intervention. This brief aims to outline ways where artificial intelligence guides these processes and in which contexts they are most suitable.

However, in instances where negotiations are not sufficient, there are two fundamental theses of intervention. One, which is clearly preferred by the international community, is of a preventative nature. This kind of intervention presupposes violence and works to counteract inflaming tensions or encroachments of land. However, the second mode of intervention—corrective and punitive—is, sadly, a large proportion of the peacekeeping responsibilities of officials as well. This brief aims to address ways that technology can enhance both aspects of this power; both by allowing officials to keep better tabs on current, ongoing violations and aiding procurement of evidence for punitive measures to be taken against aggressors and war criminals after the fact.

In order to facilitate this end-to-end process in diplomacy, trust must first be built as a prerequisite. With the introduction of technology, the matter becomes more complex and certain guiding principles must be adopted to successfully build trust. Thus, this brief will offer a broader discussion of communication infrastructure and outline several key principles and evolving findings over time regarding how to build trust for peacebuilding, while understanding how to bridge key stakeholders together. This will continue to evolve and be bridged as emerging technologies are integrated into peacebuilding work to foster communication and advance the research agenda while also potentially helping to stabilize international relations.

OVERVIEW OF GAPS

To identify potential solutions including new technologies, we must first recognize the key pain points that relevant stakeholders encounter throughout peacekeeping efforts. This section will highlight these main gaps that prevent successful conflict resolution. We strongly believe that these gaps can be partly bridged by modifications of existing technologies.

1) Negotiations: Though data and empirical evidence are often the most robust way to push conversations, far too often, diplomats and politicians reject evidence-based approaches and solutions, given issues related to trust and transparency. Therefore a simply purely data-driven approach is not enough to address gaps in negotiations, especially related to implementation. However, existing enforcement mechanisms for these human-oriented negotiations are incredibly costly. There are also some heuristic concerns, including:
    a) In instances where a concrete, definitive conclusion has to be made in negotiations, systems for opinion collection only tend to further polarize opinions.
    b) Communication methodologies may be biased towards each individual's group.

2) Monitoring: Much of the action that the UN can take is not known to them at the time and can only be executed as punishment after the tragic atrocities have already run their course. There is a need for faster information processing in existing infrastructures supporting diplomacy. Without a robust pipeline, effective and trust-based communication cannot occur successfully.

3) Restorative Justice: There are many atrocities that cannot be prevented by diplomatic methods. Technological solutions can be employed to advance remedial efforts for affected civilians and infrastructure. The idea of transitional justice provides recognition to victims through criminal trials, truth commissions, reparations, memorials, asylum, and reunification efforts, among others. This report will split tech contributions in remediation into three categories: reconstruction (i.e. humanitarian aid), refugee safety (i.e. asylum and reunification), and punitive justice (i.e. criminal trials).

4) Digital Inclusion: This is an integral, yet lacking component of all matters related to the use of technology in diplomacy, and principle development is paramount. The areas that are currently lacking include the following:
    a) Building trust with relevant local stakeholders.
    b) The accessibility of new innovations and developments.

5) Communication Gaps: There is currently a need to bridge the gap in the communication pipeline between diplomats and technologists.

CURRENT STATE/SOLUTIONS

I. Negotiations

Data Collection

Artificial intelligence has recently been best positioned to analyze patterns and trends from big data and its application in the context of organizing peace talks is no exception. Its most obvious use case is to look at large corpora and their associated data within a matter of seconds is especially useful to automate routine tasks and acquire relevant statistics and therefore free up time for strategic capabilities in crisis response. It has the capacity to monitor online platforms, domains, and social media to identify early warning signs of a crisis, track the associated spread, and identify areas that are in most need of assistance. It then can understand the context and implications of the choices that stakeholders need to face.

This enables decision-makers to not just make more informed strategic choices through AI, but aid in decision-making in various contexts to diplomats. One particular instance where this stands out is the Global Data on Events, Location, and Tone (GDELT), a platform that collects and analyzes news articles from around the world to identify patterns of conflict and tension. Powered by the Google Jigsaw unit, it identifies negotiation suggestions according to its categorization algorithm based on the Conflict and Mediation Event Observations (CAMEO) Event Codebook[1]. GDELT is not the only case study of this, however. Others include:

- Early Warning Project (which uses a model to determine the probability of different perpetrators emerging or targeting a different civilian group).[2]
- The Integrated Conflict Early Warning System (ICEWS) (which applies the same framework based on news articles, diplomatic cables, and social media sources).[3]
- The Political Instability Task Force (PITF) (which applies the same framework on more quantitative metrics).[4]

Data Processing

With the data collection and cleaning underway, the methods used by negotiators tend to revolve around finding areas of mutual agreement amidst conflict. However, conflict is usually tension-driven and purely human-based interactions and cognitive biases make this harder to complete than given. Therefore, objective decision making from data-driven reasoning is necessary. Unanimous AI's Swarm algorithm is an example of such (see Figure 1), which creates

[1] "Using GDELT for Atrocity Early Warning." The GDELT Project, 19 Mar. 2014, blog.gdeltproject.org/using-gdelt-for-atrocity-early-warning/.
[2] "Early Warning Project Statistical Risk Assessment Results." Early Warning Project, 29 Nov. 2022, earlywarningproject.ushmm.org/reports/countries-at-risk-for-mass-killing-2022-23-early-warning-project-statistical-risk-assessment-results.
[3] "Dynamic Global Conflict Risk Index - Europa.Eu." JRC Technical Reports, 2019, publications.jrc.ec.europa.eu/repository/bitstream/JRC118701/dynamic_gcri_technical_report_1.pdf.
[4] Usanov, Artur N. and Sweijs, Tim, Models Versus Rankings: Forecasting Political Violence (March 2017). Available at SSRN: https://ssrn.com/abstract=2930104 or http://dx.doi.org/10.2139/ssrn.2930104

a convergence model of thought (instead of a divergence one found in typical negotiation strategies given its priority of agreement formation). It takes inspiration from biology in how swarms form after differing biological signals find a consensus continuously after communication.[5]

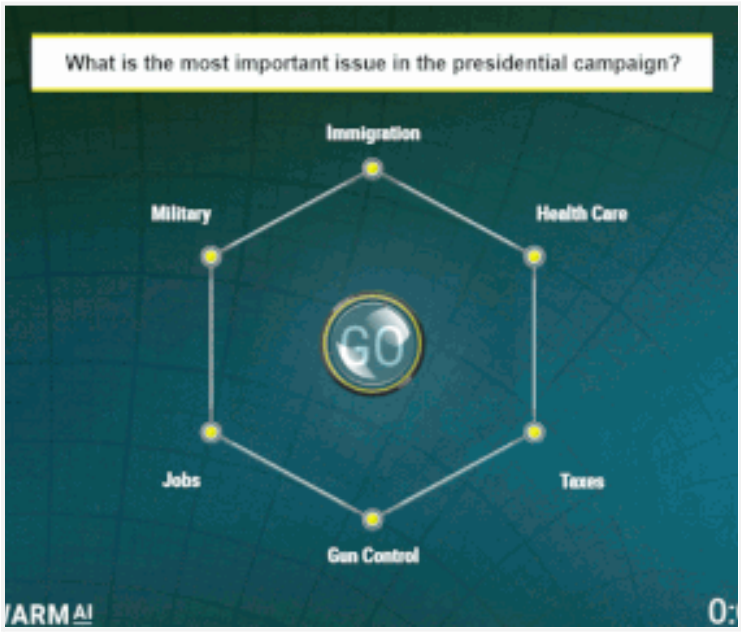

Figure 1: Visualization of Swarm

Here, users can converge on an answer by moving a graphical "puck" to a preferred corner out of a series of choices (i.e. imparting their personal intent on the swarm). This differs from a discrete vote as it acts as a stream of vectors that varies freely over time. Each user adjusts their intent continuously in real-time and so the swarm moves based on the dynamics of the full system rather than an individual. Users need to have their support system maintained over time or influence—must continuously engage the puck throughout the process, repeatedly evaluating and re-evaluating as they convey updated contributions; otherwise, their sentiment power wanes (influence on the collective outcome).

Important metrics that the algorithm include the following:

1) brainpower, which reflects sentiment strength, using an NLP pysentiment library;
2) conviction, which reflects sentiment strength for AB-comparison by correlating behavioral data of thousands of previous swarms with known sentiments;
3) faction analysis, which shows how each faction changes over time.

[5] "Artificial Swarm Intelligence White Paper." Unanimous AI - We Amplify Intelligence, 21 Jan. 2019, unanimous.ai/wp-content/uploads/2019/01/Artificial-Swarm-Intelligence-white-paper-1-21-19.pdf.

Having these quantitative metrics ensures that as debates continue, areas of similarities emerge amongst various stakeholders that bring them together. This efficiency brings cost-effectiveness as long as communication methodologies are in standard practice.

Decision Formulation

The next step in the technology-aided process is taking the output of a convergence model (i.e. common areas of agreement) and convert that into actionable recommendations. This last stage of negotiations are usually majority human-driven and technology has not penetrated this realm too far as of yet. Given the rise of LLMs, however, such models are much more feasible. AI-generated output is also able to enforce the resolution of the conversation by acting on algorithm metrics such as brainpower, conviction, and faction analysis. Doing so typically involves the combination of both a controlled pre-trained language model with a dialogue output as well as a planning engine that uses strategic reasoning to come to a conclusion. Currently, this methodology is only limited to a much more narrow scope in the context of diplomatic simulations such as the board game Diplomacy. Meta's Cicero AI model is able to conduct actions of the following[6]:

1) cooperation (with alliance formation through the discussion of potential strategies)
2) negotiation (in successfully changing the other player's mind by proposing mutually beneficial moves through a similar swarm model), and
3) coordination (which deploys the previous two moves into real-life courses of action in the game model).

This smaller microcosm allows for a lot more constraints to be accounted for with fewer extraneous variables, yet has the potential to be extrapolated into real-world situations through generalizations and past occurrences.

The way this works is by training the dialogue data from past interactions and feeding in historical context and then further training it on intents (i.e. planning actions for the agent and the agent's antagonist). Meanwhile, the strategic reasoning side uses this said input to predict future policies based on the strengths of different possible actions as it relies on a value and policy function trained through self-play that penalizes the agent from deviating from human behavior to maintain a human-compatible policy (see Figure 2). This is also recomputed every time an agent sends or receives a message.

[6] Noam, Brown. "Diplomacy Science." Github, 22 Nov. 2022, noambrown.github.io/downloads/diplomacy_science.pdf.

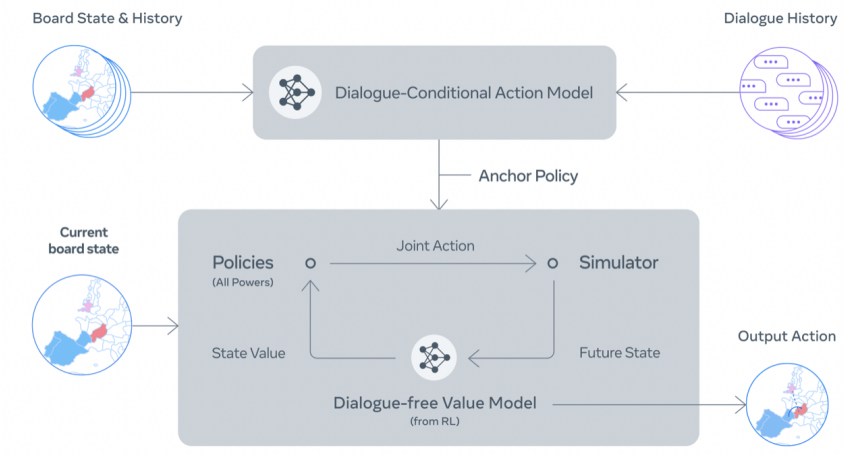

Figure 2: Strategy Engine Diagram of Cicero

Though the model's intent representation did not account for how its dialogue might affect the relationship with other players over the long-term course of a game but rather reasoned about dialogue purely in terms of players' actions in the short term, the direct negotiation gaps lie in this scope anyway. Applying this to real-world situations will only necessitate an expanded corpus of variables to consider concerning geographical and historical contexts.

II. Monitoring

Monitoring is a critical component of ensuring the terms of negotiations are adhered to. Traditional forms of monitoring range from utilizing sensors, global positioning, to other tools that can collect and aggregate data on the ground. We observe that the data collected can train machine learning algorithms to enable predictive peacekeeping allowing for policymakers to identify potential areas of conflict ex-ante.

Monitoring through Sensors

First considered in 1998, Altman et al.'s seminal publication *Sensors for Peace* in conjunction with the UN advocated for the use of unattended ground-sensor systems and other technologies in advancing peace monitoring.[7] Currently, monitoring is done through a smattering of sensor networks, though there is little centralized practice. These sensors, depending on the location and supporting institution, contribute a wide range of data to peacekeepers—from detecting chemical and biological warfare agents (and related telemetry data)[8] to basic ground sensors which detect movements in sensitive conflict zones. However, this is a space which the UN and affiliated stakeholders have identified as a point of development and most research has focused on innovation.

[7] UNIDIR, Sensors for Peace: Applications, Systems and Legal Requirements for Monitoring in Peace Operations https://www.unidir.org/publication/sensors-peace-applications-systems-and-legal-requirements-monitoring-peace-operations

[8] Enhancing the Use of Digital Technology for Integrated Situational peacekeeping.un.org/sites/default/files/20210430_-_sa-pki_technologies_research_brief_final_clean.pdf. Accessed 26 June 2023.

SAGE Database

Critically, the Situational Awareness Geospatial Enterprise (SAGE) event database tool is provided by the UN Secretariat to all peacekeeping missions to aid in tracking incidents related to violence, invasion, hijacking, and other nefarious activities. This gathering of structured data allows mission leaders to identify trends and produce early warnings,[9] though this currently does not use any machine learning methods.

Joint Mission Analysis Centres (JMACs)

Since 2006, the UN Secretariat has implemented JMACs in each peacekeeping mission. The primary function is broadly to collect and analyze the intake of data that may be useful to peacekeepers on the day-to-day, JMACs struggle mainly with budgeting and staffing support which would drive innovation beyond typical/rote data storage and collection (and protection for their data/informants).[10] All told, JMACs and SAGE drive almost all of the data work in UN peacekeeping missions.

Satellite Sentinel Project (SSP)

Furthermore, using DigitalGlobe satellite imagery, researchers were able to prove the treaty violations of both the Sudan and South Sudan governments in 2013. Both sides probably overstepped their boundaries in the Demilitarized Border Zone in the Darfur conflict.[11]

Other Initiatives[12]

- Armed Conflict Location and Event Data Project
- Global Terrorism Database
- Uppsala Conflict Data Program
- Lockheed Martin's Integrated Crisis Early Warning System
- Alan Turing Institute's project on global urban analytics for resilient defense
- US government's Political Instability Task Force
- Violence Early-Warning System (ViEWS)

Predictive Peacekeeping with Machine Learning

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[9] Duursma, Allard, and John Karlsrud. "Predictive Peacekeeping: Strengthening Predictive Analysis in UN Peace Operations." Stability, 13 Feb. 2019, stabilityjournal.org/articles/10.5334/sta.663.
[10] What Are the Benefits and Pitfalls of 'Data-Driven' Peacekeeping?, www.cips-cepi.ca/wp-content/uploads/2020/01/policy-brief-marion-laurence-1.pdf. Accessed 16 June 2023.
[11] "New Satellite Imagery Confirms Broken Agreements along the Sudan/South Sudan Border - South Sudan." ReliefWeb, 8 May 2013, reliefweb.int/report/south-sudan-republic/new-satellite-imagery-confirms-broken-agreements-along-sudansouth-sudan.
[12] The Cells That Sparked a Revolution - Nature, media.nature.com/original/magazine-assets/d41586-018-03268-4/d41586-018-03268-4.pdf. Accessed 16 June 2023.

Using the data from monitoring and data sources enables predictive algorithms—based on collected information about the location, time, and severity of violations—that might work to predict the likelihood of attacks or violence in nearby or related regions. This early warning might serve to save civilian and peacekeeper lives. There is quite a bit of work that can be done with the existing SAGE database regarding using the gathered data to run supervised learning algorithms that might identify future targets. Natural language processing can be used to synthesize freehand descriptions logged in SAGE. Having an understanding of how different events and variables determine the likelihood of intercommunal or hostile enemy violence might enhance the predictive capacity of JMAC. One challenge is that the outcomes of this predictive analysis generally deal with rare-event outcomes (i.e. inflammation of violence) whereas general supervised models are attuned to more class-balanced outcomes. However, recent research suggests that random forest algorithms (combined with logistic regression, which are not inaccessible or technically expensive) can accurately predict rare events using conflict data.[13]

The UN is uniquely positioned to do this kind of predictive analysis because of its reservoir of conflict-related data on the granular, local level. Some of the challenges associated with conflict prediction are that typically static factors are used in prediction (i.e. GDP, population density, geography), whereas SAGE and JMAC databases include information not commonly available in the news or covered in any depth elsewhere, especially when dealing with information provided by local populations with whom peacekeepers have built a rapport of trust.[14] Some possible deliverables include producing a risk map for areas of potentially higher probabilities of conflict as well as alert systems for civilians and peacekeepers in those regions. In this way, machine learning might also be able to dictate the most optimal placement of UN peacekeeping troops, since this is an undoubtedly scarce resource.[15]

Other Technologies to Explore

- Blockchain: OECD published a primer on how this is useful in the context of data transfer in peacekeeping[16]
- Use of AI in reducing the number of civilians misidentified as enemy combatants[17]
- Use of AI in reducing harm to infrastructure which might adversely affect civilians[17]
- And others: Digital information, algorithmic forensic data analysis, autonomous surveillance vehicles, advanced robotics, multispectral sensors[18]

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[13] Muchlinski, David, et al. "Comparing Random Forest with Logistic Regression for Predicting Class-Imbalanced Civil War Onset Data: Political Analysis." Cambridge Core, 4 Jan. 2017, www.cambridge.org/core/journals/political-analysis/article/abs/comparing-random-forest-with-logistic-regression-for-predicting-classimbalanced-civil-war-onset-data/109E1511378A38BB4B41F721E6017FB1.

[14] Duursma, Allard, and John Karlsrud. "Predictive Peacekeeping: Strengthening Predictive Analysis in UN Peace Operations." Stability, 13 Feb. 2019, stabilityjournal.org/articles/10.5334/sta.663.

[15] Modeling Violence as Disease? Exploring the Possibilities Of ..., www.tandfonline.com/doi/full/10.1080/13533312.2017.1383563. Accessed 16 June 2023.

[16] OECD Blockchain Primer, www.oecd.org/finance/OECD-Blockchain-Primer.pdf. Accessed 16 June 2023.

[17] Lewis, Larry. "Ai-4-Good in War." Just Security, 15 May 2018, www.justsecurity.org/56282/ai-4-good-war/.

[18] New Technology for Peace & Protection: Expanding the R2P Toolbox - JSTOR, www.jstor.org/stable/24916786. Accessed 16 June 2023.

III. Restorative Justice

Though technology can be a powerful force for resolution in active conflicts, the need for technological aid in remediation *after* conflicts is critical. Any conflict, unfortunately, will inflict damage on a region's civilians, infrastructure, and economic prospects. Helping to aid in the reconstruction of countries and the distribution of humanitarian aid, among other projects, keeps the peace in post-war nations and has the potential to relieve the suffering of millions.

Reconstruction

Major developments regarding reparations have come in three forms: increased connectivity, better monitoring of humanitarian aid needs, and better disbursement of aid needs.

The use of Digital IDs has provided a method for affected parties to claim unique identification without going through complex and often missing structures of local bureaucracy. This allows for the smooth dissemination of aid materials as well as the possibility of digital cash distribution directly to bank accounts.[19] Unmanned Aerial Vehicles (UAVs) have also been used in recent years to hasten the disbursement of medical materials and general supplies. UAVs have also been used in search and rescue missions, damage surveying, and mapping of affected conflict areas.

A wide variety of companies are involved in these missions—including, but not limited to, Matternet,[20] Draganfly[21] —and this area of humanitarian tech seems to be, empirically, one of the most developed and well-funded. This is one of the areas, for example, the private-public sector partnerships have been increasingly fruitful.

Generally, organizations like MIT Lincoln Laboratory's Humanitarian Assistance and Disaster Relief Systems Group, the UN Office for the Coordination of Humanitarian Affairs, the Harvard Humanitarian Initiative (HHI), and many others—see the 2022 updated dataset for more information[22]—have worked broadly on solving problems related to tech in humanitarian aid. However, it is important to note that the use of technology in humanitarian responses still experiences ethical, legal, regulatory, and security challenges.

Punitive Justice

The role of technology in the exposition of war crimes is an emerging field with a wide variety of contributors—from big tech companies and academics to open-source intelligence (OSINT)

[19] "Digital Identity: An Analysis for the Humanitarian Sector: IFRC." Homepage, www.ifrc.org/document/digital-identity-analysis-humanitarian-sector. Accessed 16 June 2023.
[20] "Drones Are Being Tested in the Fight against a Tuberculosis Epidemic in Papua New Guinea." VICE, 3 Dec. 2014, www.vice.com/en/article/7xj3gd/drones-are-being-tested-in-the-fight-against-a-tuberculosis-epidemic-in-papua-new-guinea.
[21] Cuenca, Oliver. "Draganfly to Provide Medical Drones to Ukraine Non-Profit." AirMed&Rescue, 24 Mar. 2022, www.airmedandrescue.com/latest/news/draganfly-provide-medical-drones-ukraine-non-profit.
[22] Academic.Oup.Com, academic.oup.com/isq/article/66/2/sqac009/6564592. Accessed 16 June 2023.

groups like Bellingcat,[23] a handful of organizations have made real, concerted progress on recent conflicts. Though not necessarily mutually exclusive, punitive justice typically comes in two major forms—the exposition of evidence for use in formal courts of law (i.e. the International Criminal Court, ICC) or for use in investigative journalism/the court of public opinion. Both are equally important and have experienced commensurate levels of innovation in the last few years.

Satellite information has been used in recent years to prove war crimes. Beginning with a seminal case in 2016, in which the ICC considered satellite imagery in prosecuting the deliberate destruction of historical sites in Mali,[24] the practice has only grown. Now, Maxar Technologies (a U.S. defense contractor), Planet, BlackSky, and Bellingcat are just a few of the groups using satellite imagery to monitor the conflict in Ukraine—from detecting mass graves[25] to proving the existence of Russian ghost ships (i.e. ships that had turned off their location tracking AIS services).[26]

Refugee Safety

It is important for refugees to be connected to the digital world for a variety of reasons—access to information regarding education, work opportunities, healthcare, aid disbursement, and reunification is increasingly happening through online mediums.[27] This relies chiefly on refugees' access to mobile and internet technologies. Different organizations, primarily NGOs, have recognized this need and have worked to create hardware and software solutions in recent years—France's SolarExperience[28] has created portable solar panels which generate electricity for charging mobile devices; Jangala[29] has managed to accomplish a similar portable device for providing internet access; while Phone Credit for Refugees[30] provides exactly what its name suggests. Note that these initiatives particularly benefit from donations and private-public partnerships as many of their offerings depend on hardware and dissemination constraints.

IV. Digital Inclusion and Building Digital Trust

The potential for the next generation of digital tools in diplomacy can only be realized if there is a continued push for digital inclusion and digital trust as these are the two greatest challenges facing effective implementation. On one hand, digital inclusion requires building up the technical capabilities required to integrate emerging technologies into peacekeeping. On the other hand, digital trust involves building trust between the end-user, policymakers, and the technology itself

[23] "The Home of Online Investigations." Bellingcat, 6 Aug. 2022, www.bellingcat.com/.
[24] "Al Mahdi." International Criminal Court, www.icc-cpi.int/mali/al-mahdi. Accessed 16 June 2023.
[25] "Watching from Space, Satellites Collect Evidence of War Crimes." NBCNews.Com, www.nbcnews.com/science/science-news/ukraine-satellites-war-crimes-rcna26291. Accessed 16 June 2023.
[26] Ballinger, Ollie. "Grain Trail: Tracking Russia's Ghost Ships with Satellite Imagery." Bellingcat, 23 May 2023, www.bellingcat.com/news/2023/05/11/grain-trail-tracking-russias-ghost-ships-with-satellite-imagery/.
[27] Grandi, Filippo. "Internet and Mobile Connectivity for Refugees – Leaving No One Behind." UNHCR Innovation, 5 July 2018, www.unhcr.org/innovation/internet-mobile-connectivity-refugees-leaving-no-one-behind/#:~:text=Reliable%20mobile%20and%20Internet%20connectivity,as%20in%20their%20own%20countries.
[28] "Page d'accueil." Solar Experience, 2 Mar. 2023, solarexperience.fr/.
[29] Jangala, www.janga.la/. Accessed 16 June 2023.
[30] "Phone Credit for Refugees." Phone Credit for Refugees, www.pc4r.org/. Accessed 16 June 2023.

to ensure that the concerns of stakeholders are addressed and the technology is reliable and secure.

Digital Inclusion

State and government officials are increasingly using 21st-century communication technology in diplomatic engagement to advance national interests on the global stage. This enables them to maintain the direction and management of diplomatic engagement with a globalized environment of information. However, technological transformation comes with great responsibility. Principles and frameworks like digital inclusion must be adopted in their careful implementation to realize the benefits.

In 2012, the National Academy of Engineering and the United States Institute of Peace held a joint workshop constituting the Roundtable on Technology, Science, and Peacebuilding. Their report, titled "Using Data Sharing to Improve Coordination in Peacebuilding," summarized the principal goals of the Roundtable, the purpose of "Harnessing Information for a Shared Vision," and emerging themes from the workshop. The goals were:

> "to accelerate the application of science and technology to the process of peacebuilding and stabilization; to promote systematic, high-level communication between peacebuilding and technical organizations on the problems faced and the technical capabilities required for successful peacebuilding; [and] to collaborate in applying new science and technology to the most pressing challenges faced by local and international peacebuilders working in conflict zones."[31]

Digital Trust

The findings concluded that data sharing requires proper navigation of cross-culture divides, an establishment of trust, the digitizing of discussions, and an aligned collaboration software with end-user needs.[36] Since then, there have been more reports recently offering additional principles and context for building trust as technology is used. Harvard Business Review found that digital trust varies in different regions. Nevertheless, there are four key principles: "1) the security and trustworthiness of an economy's digital environment; 2) the quality of the digital user experience; 3) the extent to which users trust their digital environment; and 4) the extent to which users actually use the digital tools available to them." This results in a stable digital landscape.

[31] Olson, Steve, and Andrew Robertson, eds. Using Data Sharing to Improve Coordination in Peacebuilding: Report of a Workshop by the National Academy of Engineering and United States Institute of Peace: Roundtable on Technology, Science, and Peacebuilding. National Academies Press, 2013.

Regarding peacebuilding more specifically, the Institute for Peace Research and Security Policy found that post-conflict and peacebuilding interventions necessitate trust-building between citizens and state security actors, especially through personal encounters.[32] Yet, survey findings from across the global suggest trust in state institutions is eroding. Hence, the problem of mistrust today globally extends beyond technology and to institutions as a whole, as other recent events have shown.

Therefore, the Data Quality Campaign identifies three variables to guide data communicators in understanding their audience while building trust: proximity, context, and framing.[40] Overall, building trust is a large gap when it comes to diplomacy and peacebuilding, especially with the integration of emerging technologies. Placing care to the development and maintenance of communication infrastructure must be taken to increase the spread of information processing. Furthermore, digital inclusion, community building, and other key principles stated in the aforementioned must be effectively prioritized and adhered to for effective fostering of trust in peacebuilding.

Lastly, the study advances a theoretical framework of 'Noopolitik,' (network-based "political knowledge" in Greek) which describes a strategy adapted to the information age, contrasted with the more traditional hard power approach of Realpolitik. The basic premise of Noopolitik is that public diplomacy increasingly takes center stage in the practice of diplomacy. Noopolitik broadens the definition of public diplomacy to prioritize local publics equally with foreign ones and also allows for skillful policymakers to alternate between the two. This framework has led to the convergence of any stakeholder in diplomatic engagement, regardless of their national interests and involvement in state and non-state actors.[36]

V. Bridging The Gap

Digital Diplomacy

Bridging the gap between diplomats and technologists is paramount, and another recent study found digital transformations of diplomacy can advance a new research agenda in international politics: "to rethink core issues of governance, order, and international hierarchy," and thus lead to the emergence of new practices of digital diplomacy.[33] The study proposes a focus on a set of questions to investigate further with respect to this evolution in the gap:

1) How do encounters with digitalization reshape the diplomatic profession?
2) How do digital diplomats challenge traditional diplomats?
3) What is the relationship between online and offline practices of diplomacy?
4) What practical difference does the absence of face-to-face interactions make?

[32] Ming'ala, Mildred. The Role Of 21st Century Communication Technology In Diplomatic Engagement. Diss. University of Nairobi, 2019.
[33] Hedling, Elsa, and Niklas Bremberg. "Practice approaches to the digital transformations of diplomacy: toward a new research agenda." International Studies Review 23.4 (2021): 1595-1618.

5) How do online audiences contribute to enacting diplomacy? What are the constitutive effects of online visibility?

All of these are critical to consider as emerging technologies are integrated to bridge the gap between diplomats and technologists.

Science and Diplomacy

Lastly, recent studies have found that science and diplomacy are complementary and science-driven foreign policy is a must-have.[34] They find science diplomacy is essential in stabilizing international relations by using innovation to support economic, environmental, and societal well-being. Cooperation between countries not only transitions resource-based economies to knowledge-based ones, but also yields solutions in line with the sustainable development goals.[35]

In summary, the gap between diplomats and technologists is positively evolving with mutual benefits but must be supervised appropriately to ensure standards and security are intact. The implications are great for effectiveness, stability, and international relations in the 21st century.

[34] Podesta, Kristina. "Building Trust in Data Requires Building Trust with Communities: DQC." Data Quality Campaign, 19 May 2022, https://dataqualitycampaign.org/building-trust-in-data/.
[35] Chakravorti, Bhaskar, et al. "How Digital Trust Varies around the World." Harvard Business Review, 31 Aug. 2021, https://hbr.org/2021/02/how-digital-trust-varies-around-the-world.

RECOMMENDATIONS

We have identified three strategic goals, two of which are primarily for the public sector with the final goal primarily for interested entities in the private sector in particular. These goals aim to increase the integration of emerging technologies into peacekeeping, reforming public funding mechanisms for such technologies, and bolster public-private partnerships. Together, we strongly believe that these recommendations can bridge the divide between diplomats and technologists as well as improve existing diplomatic approaches.

I. Integrating Technology into Practice

The section will focus primarily on how the existing technologies discussed in previous sections can be integrated into practice. We will highlight the potential and ways to overcome the existing pitfalls of current technology.

AI Models for Data Collection

As observed in tried and tested solutions in the former section, AI has shown tremendous potential in automating and optimizing various tasks. Models for data collection are likewise an invaluable tool for improving data management and analysis in the context of consensus-based algorithms and recommendation engines as described in the previous section. However, in order for this process to be optimal and open for extrapolation in a variety of real-life applications, variables and metrics for data processing must be outlined as much as possible.

Firstly, data variables should be outlined considering the dependent factor at hand. This can range from demographic (age, gender, location, occupation, etc.) and behavioral variables when human elements are present, contextual and categorical variables for event-centric instances, and a good mix of quantitative and qualitative elements as well. This ensures a robust set of training data that will eventually be fed into a recommendation engine, as was in the case of the Swarm algorithm's metrics of cooperation, negotiation, and vulnerability.

Secondly, additional metrics should include data quality measures to assess the completeness, consistency, and accuracy of the collected data, and model performance metrics. This can be conducted either in real-time or periodically, and accounts for computational efficiency metrics (a measure of time and resources required for data processing and model inference). Similar to how the Swarm algorithm considered brainpower, conviction, and faction analysis, the stakeholder should have some way to measure key performance indicators.

It is important to note that the selection of variables and metrics should be tailored to the specific use case, ensuring they align with the objectives and desired outcomes. Domain knowledge and

collaboration with relevant stakeholders can greatly assist in determining the most appropriate variables and metrics for the AI model.

To ensure the ability for replicable results, one should note the importance of training AI models; this will utilize existing data sets to train the selected AI models. If necessary, one must consider augmenting the data with external sources or synthetic data generation techniques to improve model performance. Continuously fine-tuning and updating the models is necessary to adapt to changing data patterns and ensure optimal performance while regularly monitoring the performance of the AI models and evaluating their effectiveness in improving data collection and processing. In the case of the Cicero model, one can emulate its fundamental architecture but feed in a pattern of thematic current events for more versatile use cases.

Communication Methods for Improving Negotiations

To enhance the efficiency and effectiveness of negotiations, it is recommended to integrate an ecosystem of virtual collaboration tools into the process. AI-assisted software currently offers a wide range of tools and platforms that can facilitate seamless communication, information sharing, and decision-making during negotiations. This process would model the following methodology:

1) Identify the specific target issues in question that are related to communication and collaboration, e.g. language barriers, time zone instances, real-time and secure document sharing, and editing, to name a few.
2) Ensure project management software, document-sharing tools, real-time messaging platforms, and video conferencing extensions, are aligned with the identified challenges. These typically should have a level of encryption, user access controls, and data protection measures.
3) Incorporate previous archives of relevant documents, research findings, and data with the negotiation team in a centralized and easily accessible matter. This facilitates a procedural pathway to what is needed for real-time document collaboration, something that will culminate in cloud-based document sharing and editing tools to collaborate on negotiation proposals, contracts, or agreements in real-time. This allows multiple parties to contribute, suggest revisions, and track changes simultaneously, reducing delays and enhancing efficiency. Real-time decision-making will also implement virtual tools that enable participants to vote, prioritize options, or express preferences in real-time. These tools help streamline the decision-making process, ensure inclusivity, and provide a transparent framework for reaching consensus.
4) Regularly assessing the effectiveness of the virtual collaboration tools implemented during negotiations will gather feedback from participants to identify areas for improvement, address any technical issues, and refine the model as needed.

By integrating virtual collaboration tools into the negotiation process, organizations can overcome geographical barriers, streamline information exchange, and enhance decision-making. These tools can foster more efficient and effective negotiations, enabling better outcomes and improved relationships among the parties involved.

Machine Learning in Predictive Peacekeeping Recommendation I: Utilize the SAGE database with NLP and predictive analysis techniques

The SAGE database offers data critical to peacekeeping missions, and its use can be enhanced with machine learning such as natural language processing and predictive analysis techniques. Certain approaches improve accuracy in predicting rare events critical to understanding conflicts in a region. In this process, more investment can be made in research and development, data collection and integration can be enhanced, supervised learning models can be developed, and risk mapping and alert systems can be created.

Machine Learning in Predictive Peacekeeping Recommendation II: Prioritize a Human-Centered Approach

There are various challenges associated with predictive peacekeeping. These include the endangerment of local informants in areas of conflict, cybersecurity issues, and the effectiveness of peacekeepers in protecting civilians. The implications include the erosion of trust between troops and communities as well as abuse of power and sexual violence. Hence, a human-centered approach must be prioritized even as technological enhancements are made to peacekeeping.

Blockchain Applications: Blockchain as Verification

As exemplified already by Hala Systems, using blockchain technology as a means for verifying digital evidence is a promising new field of work. However, there is also emerging work in regard to using blockchain to combat digital disinformation. There have been groups in the past who have worked to create products to this effect (see: BitPress's Misinformation Detector[36]), though these are generally not well-funded or centralized—or have been defunct for some time. Fact Protocol[37] is a well-funded startup emerging in the space that is worth looking into.

This is an incredibly promising technology—as hinted to by the amount of research and innovation which have cropped up in recent years—particularly because blockchain can lend credibility to a digital asset's time and location at the time of creation and guarantee the original

[36]"BitPress." Credibility Coalition, credibilitycoalition.org/credcatalog/project/bitpress/. Accessed 16 June 2023.
[37]"Employing Blockchain to Combat Fake News & Disinformation." Fact Protocol, 13 June 2023, fact.technology/.

formatting. It can serve fundamentally as a "supply-chain record" for facts,[38] something which might help restore public trust in news, a not insignificant modern challenge. This space is not yet dominated by a single, or even a handful of, players, and investments into promising organizations might prove to be incredibly valuable.

Cybersecurity in Humanitarian Efforts

Callisto, for example, is a sexual assault evidence collection and matching platform whose entire product is built on the premise (and promise) of a uniquely designed cryptography system built to protect the information of all those who have their health and biometric data stored.[39] Although not primarily associated with conflict, Callisto is a good example of how important trust and security are in efforts of remediation generally. When advocating for programs that might store biometric data to help connect estranged refugees or employ greater use of digital IDs, for example, these platforms cannot fundamentally function without a great emphasis on cryptography and cybersecurity. As conflicts increasingly come to be fought both on the ground and over the web—Ukraine, for instance, has spent months thwarting Russia's many cyber attacks[40]—humanitarian forces should remember that cybersecurity is not only a problem in conflict but also in remediation.

Just as in building a PIT force, investing in cybersecurity lays the groundwork for successful technologies to be built and deployed efficiently, effectively, and safely when the time comes. Unlike in Silicon Valley, "move fast and break things" will not serve as a satisfactory model for technological development—moving carefully and thoughtfully is non-negotiable when lives are at stake. This starts with good design and cybersecurity.

II. Public Investment in Emerging Technologies

While there is incredible potential for current technologies to be implemented, the United States government should consider investing in the future of diplomatic technologies. We strongly believe that the government should increase funding in a public interest technologist workforce and create a centralized way to publicly invest in diplomatic emerging technologies.

Creating a Public Interest Technologist Workforce

Fundamentally, peacekeeping (as in other public interest fields) struggles to attract a large base of technically talented workers. As a result, funding, innovation, and quality are hampered, at least to some degree. One primary recommendation is to focus on the cultivation of a "public

[38] "The Blueprint for Blockchain and Social Innovation." New America, www.newamerica.org/digital-impact-governance-initiative/blockchain-trust-accelerator/reports/blueprint-blockchain-and-social-innovation/the-future-of-blockchain-for-social-impact/. Accessed 16 June 2023.
[39] "The Way You Are Supported to Tell Your Story Can Make All the Difference." Callisto, www.projectcallisto.org/. Accessed 16 June 2023.
[40] "Ukraine Gears up for New Phase of Cyber War with Russia." POLITICO, www.politico.com/news/2023/02/25/ukraine-russian-cyberattacks-00084429. Accessed 16 June 2023.

interest tech workforce." This idea is heavily advocated for by The Public Interest Technology University Network (PIT-UN)[41] through programs at and partnerships with over 58 American universities. Their programs—like the Summer Fellowship for Public Sector AI Governance (PS-AIG) and Career Pipeline and Placement[42]—provide internship, research, networking, and educational opportunities for students looking to embrace the role of a PIT (Public Interest Technologist).

Outside of PIT-UN, several academic institutions (e.g., labs, research groups, individual professors[43]) and private organizations (like Gov AI[44]) work to encourage students of all ages—from high school to postdocs—to orient their technical skills towards complex societal problems. To further support their work and other similar initiatives would not only produce meaningful research results but would serve as a vote of confidence and investment into the proliferation of a new generation of public interest technologists. Young technologists need to know—in the cacophony of job options—that this is a viable career choice. The monetary support of academic or research opportunities provides excellent signaling for their future career viability, something that is currently sorely lacking.

Establish a Centralized Mechanism for Public Investment in Diplomatic Emerging Tech

The State Department recently established the Office of the Special Envoy for Critical and Emerging Technology (S/TECH) in 2023 to focus on the "international strategy" of the United States in dealing with emerging technologies. We believe that this agency, with the help of Congress, is uniquely positioned to serve as a coordinator in fostering a competitive ecosystem for advancing emerging technologies in diplomacy. The model for our recommendation is the Directorate for Technology, Innovation and Partnerships (TIP) authorized by the CHIPS Act, in which the office coordinates National Science Foundation (NSF) grants to incentivize use-inspired research and translate existing research into society.

We recommend that S/TECH serve as the focal point for coordinating existing and future government grants related to diplomatic emerging technologies**.** Since conflicts are unpredictable, creating a product for a specific conflict with proper testing is costly and inefficient. S/TECH can serve as the hub where companies are incentivized to adapt their existing product to meet the needs of the State Department in the most cost-effective manner. This eliminates the misalignment of incentives between the public-private sector and allows for private firms to take necessary risks to innovate advancements to diplomatic emerging technologies. Our proposal is a strategic refocus of funding for the State Department more

[41]"Public Interest Technology University Network." PITcases, 12 June 2023, pitcases.org/.
[42]"2021 Challenge Career Pipeline & Placement." PITcases, 22 July 2022, pitcases.org/2021-challenge-career-pipeline-and-placement/.
[43]Nault, Kellie. "Milind Tambe Is Pioneering AI for Social Good • the Lakshmi Mittal and Family South Asia Institute." The Lakshmi Mittal and Family South Asia Institute, 10 Mar. 2022, mittalsouthasiainstitute.harvard.edu/2022/03/milind-tambe/.
[44]"Summer Fellowship 2022 Wrap up - What Did Our Fellows Work on?: Govai Blog." RSS, www.governance.ai/post/summer-fellowship-2022-wrap-up. Accessed 16 June 2023.

broadly and S/TECH in particular. Congress should seek to earmark funding specifically for the research and application of emerging technologies in diplomacy.

III. Recommendations for the Private Sector

While we believe the private sector has the potential to touch, if not greatly influence, each of the previous recommendations, the following suggestions are specific enough to be immediately actionable.

Establishing a Forum to Coordinate Private-Sector Investments in Diplomatic Emerging Technology

A coordinated effort by the private sector may be more efficient and mutually beneficial for both the firm and the aid recipient. The forum would allow firms to coordinate their humanitarian support which may increase synergy between their respective products. We have included a list of companies that have donated their products or services in past humanitarian efforts that should be considered for the forum. (see Appendix).

Increase Coordination with the State Department and other Peacekeeping Organizations to Maximize Investment Impact

The State Department lacks an independent VC firm that can serve as an independent, strategic, not-for-profit investor such as In-Q-Tel which the intelligence community relies on to stay on top of new developments in emerging technology. There is an opportunity for an organization to serve as a bridge between public entities and private firms to supply diplomats with the newest technology. The government procurement process for new technology tends to be slow which can hamper the development and implementation of emerging tech. The VC model of funding is more effective at producing the necessary innovations due to its allowance for higher-risk investments that many politicians would be hesitant to fund.

APPENDIX

Examples of Public-Private Partnerships

1. Telecommunications
    a. To help customers needing to connect with family, friends, and loved ones, USCellular is offering customers free calls to Ukraine from the United States from Feb. 25 through June 30, 2023, with no international dialing rates applied.
    b. 20,000 Starlink satellite units have been donated to Ukraine for cellular connections, and SpaceX has requested support for additional funding at the rate of tens of millions of dollars per month .
    c. Cisco donated networking equipment to aid organizations working on the Horn of Africa's famine crisis to support their efforts.
    d. Ericsson has worked with the UNHCR to provide mobile connectivity to refugees and displaced persons in conflict zones, as well as Save the Children for internet access.
    e. Mobile money providers have been launching their own services, such as M-PESA Chama in Kenya, EcoCash Savings Club in Zimbabwe, and M-Koba in Tanzania to facilitate ease of transactions in UNHCR-related aid, leading to 2.7 million people in 44 countries receiving cash and voucher assistance (CVA).
2. Pharmaceuticals
    a. 23andMe has offered to donate kits and resources to do the genetic testing to help reconnect children with their parents, especially by the Mexican border.
    b. More than 370,000 insulin pens are being disseminated to hospitals, made possible with support from the pharmaceutical company Novo Nordisk, which impacts over 9% of affected areas in Ukraine.
    c. Genesis Health Systems shipped an undisclosed amount of boxes of medical supplies which each contain $1000 in supplies from wound dressings, scalpels, stethoscopes, penlights, prep pads, and Steri-Strips.
    d. Johnson & Johnson has donated millions of dollars and medical supplies to support relief efforts in response to natural disasters and humanitarian crises around the world.
    e. Pfizer has donated millions of doses of its pneumococcal vaccine to the Global Alliance for Vaccines and Immunization (GAVI) to help prevent the spread of pneumonia in developing countries, especially in conflict zones.
3. Energy
    a. Bella Group and the Yonomequito Foundation sent a shipment of generators to Ukraine, which will be delivered to its destination in partnership with the Global Empowerment Mission and Bstrong.
    b. Caterpillar donated generators to the International Rescue Committee (IRC) to support the organization's humanitarian relief efforts in Syria.

c. Cummins donated generators to the United Nations Development Programme (UNDP) to support the organization's work in Yemen.
d. Schneider Electric donated solar panels and energy storage solutions to the IRC to support the organization's humanitarian relief efforts in Cameroon.
e. GE donated generators to the International Medical Corps (IMC) to support the organization's humanitarian relief efforts in Iraq among many other regions in the MENA conflict zone areas.

4. Logistics
    a. FedEx's relief aid package of 1.5M USD was given to UNICEF which includes 1M in in-kind shipping to organizations who are transporting supplies in Ukraine.
    b. DHL has partnered with the International Committee of the Red Cross (ICRC) and Médecins Sans Frontières (MSF) to provide free delivery services in conflict zones.
    c. Maersk, a global shipping company, transported medical supplies, food, and essential goods to people affected by natural disasters.
    d. In 1989, UPS partnered with CARE to create the UPS Relief Link, a program that provides logistical support to emergency relief efforts around the world.
    e. In 2005, DHL launched its Disaster Response Team, which provides logistical support to relief efforts in the aftermath of natural disasters.
5. Detection
    a. Microsoft is donating cloud services at no cost through 2023 in addition to cyber security defense and threat detection services.
    b. Esri, a geographic information system (GIS) company has worked with aid organizations to develop maps and geospatial tools for conflict zones.
    c. Palantir, a data analytics company has donated its software to track and analyze data on displaced persons while monitoring food and water supplies.
    d. Google's Crisis Response team has developed tools like Google Person Finder, which helps people locate missing loved ones after natural disasters, and Google Earth Outreach, which provides satellite imagery and mapping tools.
    e. Tableau Foundation, which provides free software licenses and training to non-profit organizations working in areas like public health, and disaster response, with data visualization tools specifically designed for humanitarian aid organizations.

About the Emerging Technology Group

The Emerging Technology Group (ETG) is a youth-led nonprofit dedicated to promoting the study of emerging technologies and leveraging them to solve real-world problems. Modeled off Google's X, ETG is a 'moonshot factory' — our teams leverage their skills in artificial intelligence, biotechnology, and more to conduct pro bono research, write policy proposals, and design technical tools to solve problems with more than 10 partners and collaborators, including government and international agencies, local NGOs, and firms across 5 continents. We also provide free technology education curricula and guest speak at professional development workshops, with our work cumulatively reaching over 3,200 students worldwide.