















## Conclusions and Future Work

Our whimsical example demonstrates that the current AI development practice does not suffice when creating high-stakes AI, where errors of misuse and disuse can lead to devastating losses of life and liberty. It is the responsibility of the development team to ensure that they produce high-quality (trustworthy) AI that allows the user to accurately perceive this quality (trust calibration); without this consideration, there is a high potential for misuse and disuse of the software. From our reference model of HMI, we proposed a GQM approach that seeks to maximize the Coherent Use of an AI. This approach is embedded within the DevOps lifecycle to help maintain development agility.

Future work on this GQM template involves maturing the language used for each of the template questions as well as developing a deeper understanding of the correct metrics to use in certain product scenarios. In addition, the template can be tested on an actual (rather than hypothetical) AI where real data can be gathered regarding trustworthiness and trust calibration.

## References

- Adenowo, A. A.; and Adenowo, B. A. 2013. Software Engineering Methodologies: A Review of the Waterfall Model and Object-Oriented Approach. *International Journal of Scientific & Engineering Research*, 4(7): 427–434.
- Alnafessah, A.; Gias, A. U.; Wang, R.; Zhu, L.; Casale, G.; and Filieri, A. 2021. Quality-Aware DevOps Research: Where Do We Stand? *IEEE Access*, 9: 44476–44489.
- Basili, V. R.; Caldiera, G.; and Rombach, H. D. 1994. The Goal Question Metric Paradigm. *Encyclopedia of Software Engineering*, 528–532.
- Boyce, M. W.; Chen, J. Y.; Selkowitz, A. R.; and Lakhmani, S. G. 2015. Effects of Agent Transparency on Operator Trust. In *Proceedings of the Tenth Annual ACM/IEEE International Conference on Human-Robot Interaction Extended Abstracts*, HRI'15 Extended Abstracts, 179–180. New York, NY, USA: Association for Computing Machinery.
- Carnahan, M. M.; Goddard, D.; and Lindelof, D. 2013. World War Z. Screenplay.
- Cooper, A. 2021. Police departments adopting facial recognition tech amid allegations of wrongful arrests. <https://www.cbsnews.com/news/facial-recognition-60-minutes-2021-05-16/>. Accessed: 2021-10-26.
- Dawson, M.; Burrell, D. N.; Rahim, E.; and Brewster, S. 2010. Integrating Software Assurance into the Software Development Life Cycle (SDLC). *Journal of Information Systems Technology and Planning*, 3: 49–53.
- de Weck, O. L.; Ross, A. M.; and Rhodes, D. H. 2012. Investigating relationships and semantic sets amongst system lifecycle properties (ilities).
- Ebert, C.; Gallardo, G.; Hernantes, J.; and Serrano, N. 2016. DevOps. *IEEE Software*, 33(3): 94–100.
- Flournoy, M. A.; Haines, A.; and Chefitz, G. 2020. Building Trust through Testing. <https://cset.georgetown.edu/event/building-trust-through-testing/>. Accessed: 2021-12-11.
- General, J.; and Sarlin, J. 2021. A false facial recognition match sent this innocent Black man to jail. *CNN Business*.
- Jain, S.; Luthra, M.; Sharma, S.; and Fatima, M. 2020. Trustworthiness of Artificial Intelligence. In *2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS)*, 907–912.
- Kakao AI Report. 2017. Meta-analysis on 6,163 papers of ICML&NIPS. <https://medium.com/@kakaoreport/meta-analysis-on-6-163-papers-of-icml-nips-cbef530eaaf6>. Accessed: 2021-12-09.
- Krisher, T. 2021. 3 crashes, 3 deaths raise questions about Tesla's Autopilot. *AP NEWS*.
- Lee, J. D.; and See, K. A. 2004. Trust in Automation: Designing for Appropriate Reliance. *Human Factors*, 46(1): 50–80. PMID: 15151155.
- Musk, E. 2021. If you want the Tesla Full Self-Driving Beta downloaded to your car, let us know. Doubling beta program size now with 8.2 & probably 10X size with 8.3. Still be careful, but it's getting mature.
- Okamura, K.; and Yamada, S. 2020. Adaptive trust calibration for human-AI collaboration. *PLOS ONE*, 15(2): 1–20.
- Parasuraman, R.; and Riley, V. 1997. Humans and Automation: Use, Misuse, Disuse, Abuse. *Human Factors*, 39(2): 230–253.
- Polizzotto, L.; and Molella, A. 2019. The Value Balance. *IEEE Engineering Management Review*, 47(4): 24–31.
- Siddiqui, F. 2021. Tesla owners can now request 'Full Self-Driving,' prompting criticism from regulators and safety advocates. *Washington Post*.
- Software Engineering Institute. 2021. 2020 SEI Year in Review. Technical report, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Thiebes, S.; Lins, S.; and Sunyaev, A. 2021. Trustworthy artificial intelligence. *Electronic Markets*, 31(2): 447–464.
- Tomsett, R.; Preece, A.; Braines, D.; Cerutti, F.; Chakraborty, S.; Srivastava, M.; Pearson, G.; and Kaplan, L. 2020. Rapid Trust Calibration through Interpretable and Uncertainty-Aware AI. *Patterns*, 1(4): 100049.
- Varshney, K. 2021. Foundations of trustworthy AI: How to conduct trustworthy AI assessment and mitigation. <https://www.ibm.com/blogs/watson/2021/06/trustworthy-ai-assessment-mitigation/>. Accessed: 2021-12-11.
- Vergun, D. 2021. Artificial Intelligence Key to Maintaining Military, Economic Advantages, Leaders Say. <https://www.defense.gov/News/News-Stories/Article/Article/2567486/artificial-intelligence-key-to-maintaining-military-economic-advantages-leaders/>. Accessed: 2021-12-11.
- Weise, K. 2021. Amazon indefinitely extends a moratorium on the police use of its facial recognition software. *The New York Times*.