How do AI systems fail socially? Social Failure Mode and Effect Analysis for Artificial Intelligence Systems

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Background

Failure Mode and Effect Analysis (FMEA) is part of standard risk management in automotive, aerospace and medical devices industries [1].

An FMEA is an engineering risk analysis tool used to identify, analyze and mitigate potential failure modes (ex. flat tire on a bike). [1] Researchers have recognized the applicability of FMEAs for algorithmic auditing [2].

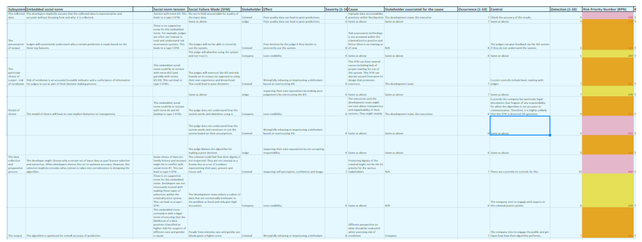
Building on Millar's definition of social failure modes, we propose a modified FMEA process to identify sociotechnical failures for AI systems.

Social failure modes(SFM) occur when social norms embedded in a technology are not supported or are in tension with existing with a societal norm [3]

Social FMEA Case Study: COMPAS

Use case: risk assessment algorithm to determine likelihood of recedivism for criminal suspects

Figure 1. Snapshot of a the sample Social FMEA

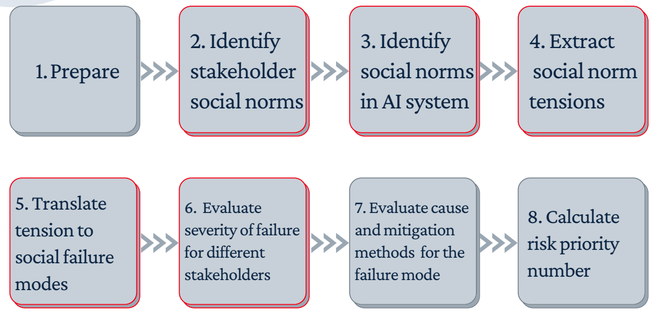


Social norm 1: ensure the likelihood of a false positives (classified as higher risk) for suspects of different race and gender is equal.
Social norm 2: the algorithm is optimized for overall accuracy of prediction.

Scan for full COMPAS FMEA

Social Norm Tension and SFM: People from minority races and gender falsely receive a higher score. [4]

Social FMEA Process



Discussion and Next steps

- This preliminary work develops a systematic way of identifying social failure modes and provides a case study. **How could we make this process more practical and granular?**
- FMEAS and Social FMEAs are resource intensive. **How could they be adapted for the fast-paced AI system development process?**

AI SYSTEMS IMPACT MANY LIVES. IT IS IMPORTANT TO DEVELOP TECHNIQUES FOR ANALYZING AND UNDERSTANDING HOW THEY MIGHT FAIL AND CAUSE HARM.

[1] C. S. Carlson, Effective FMEAs. Hoboken, New Jersey: John Wiley & Sons, Inc., 2012.
[2] I. D. Raji, A. Smart, R. N. White, M. Mitchell, T. Gebru, B. Hutchinson, J. Smith-Loud, D. Theron, and P. Barnes, "Closing the AI accountability gap," Fairness, Accountability, Transparency Conference., pp. 33–44, 2020.
[3] J. Millar, "Social Failure Modes in Technology and the Ethics of AI," Oxford Handb. Ethics AI, no. February 2021, pp. 441–461, 2020.
[4] S. M. Julia Angwin, Jeff Larson and L. Kirchner, "Machine Bias," 2016. [Online]. Available: https://www.propublica.org/article/machinebias-risk-assessments-in-criminal-sentencing