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AI based Media Functional Safety and Reliability Verification in Safety-Critical Autonomous Systems

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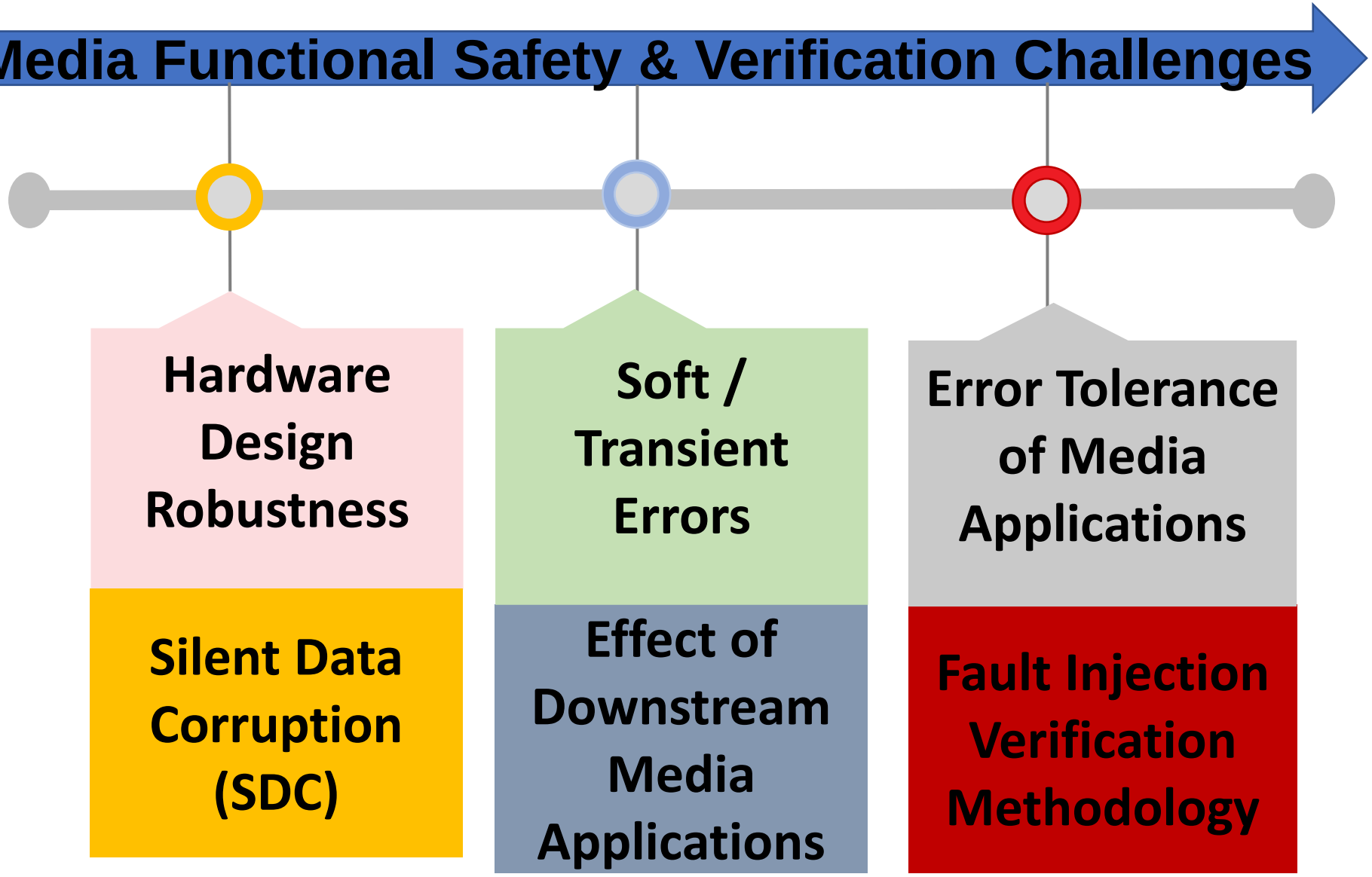
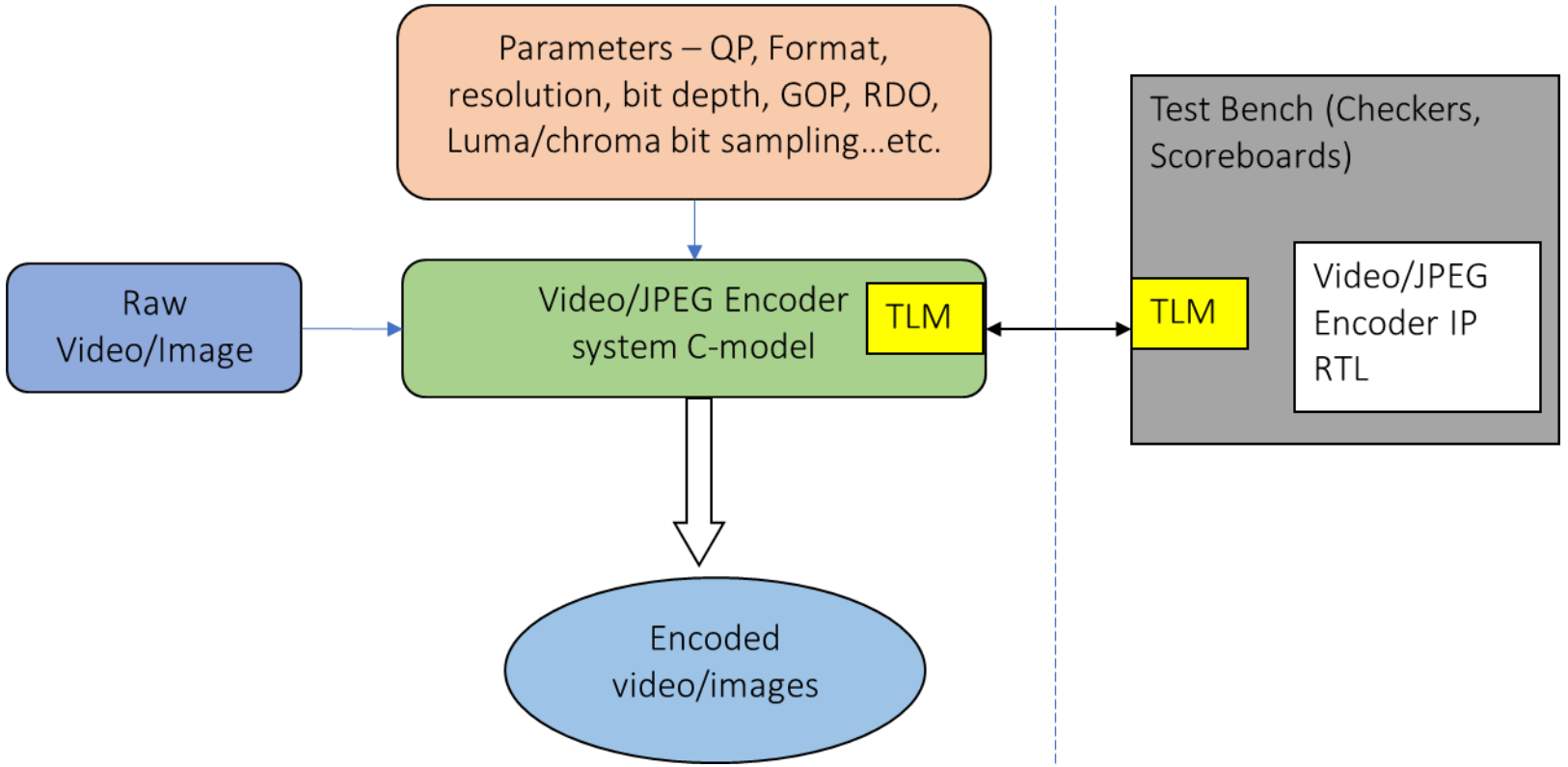
accellera
SYSTEMS INITIATIVE

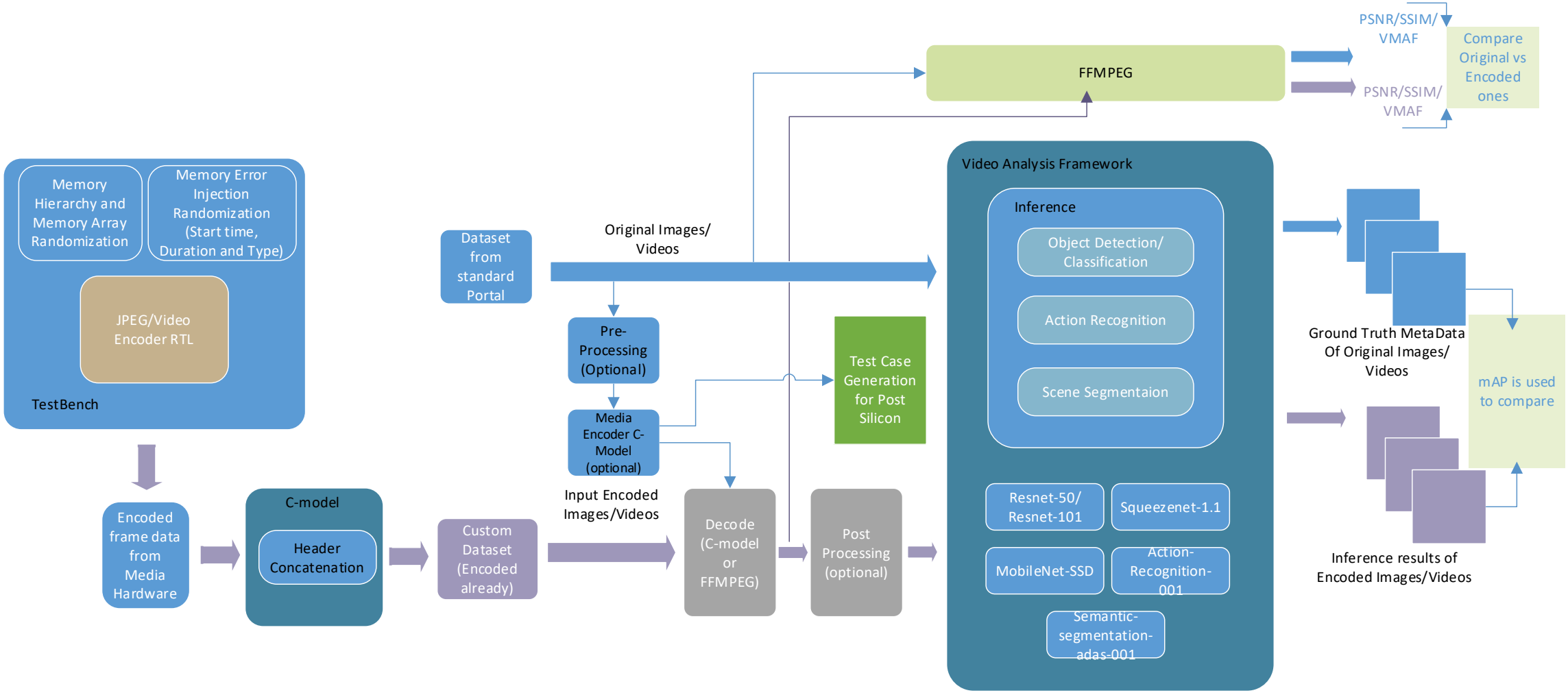
Media Functional Safety & Verification Challenges



Traditional System-C based Verification

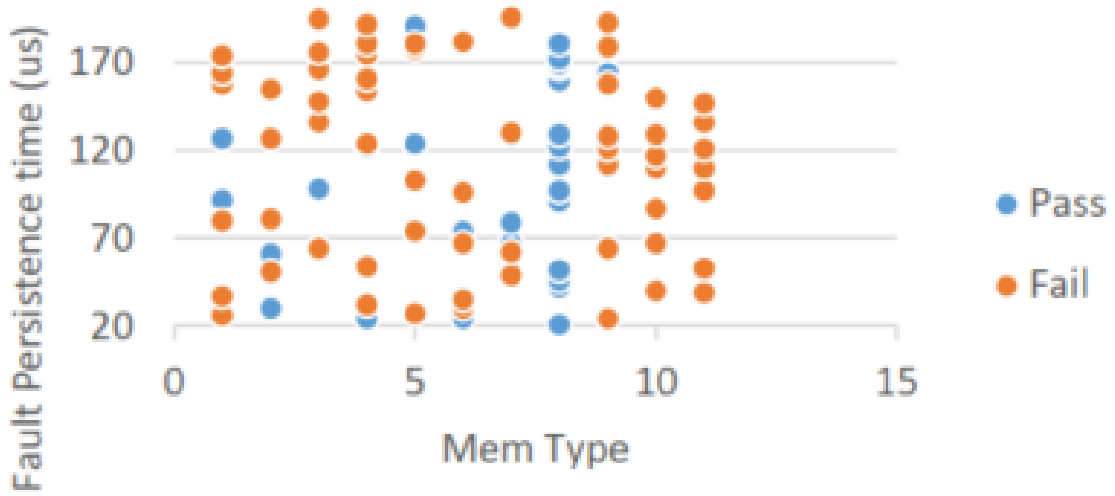


AI based Verification Methodology



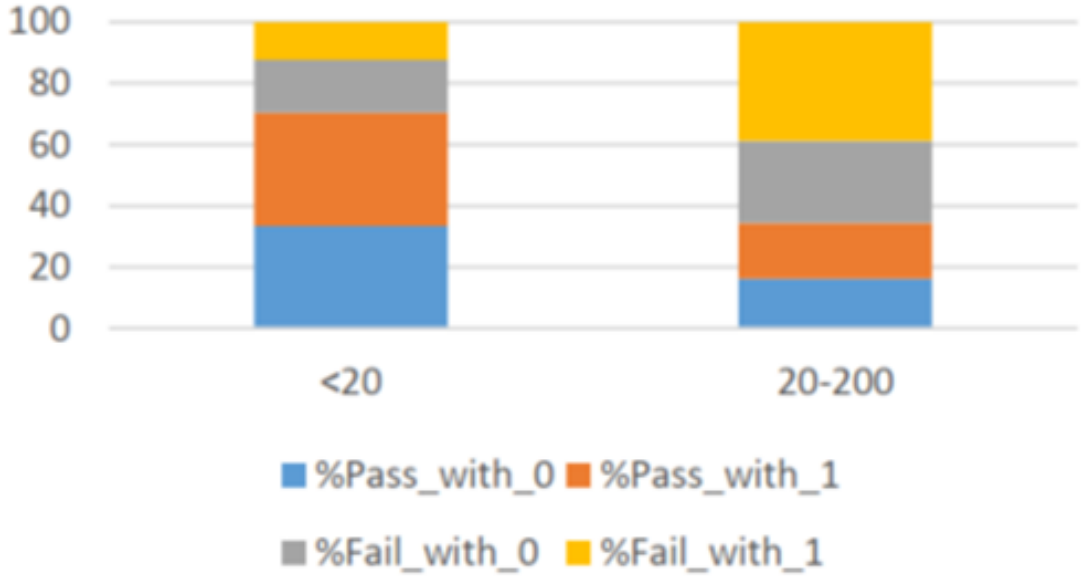
Results

Scatter Plot – pass and fail fault persistence for each memory instance

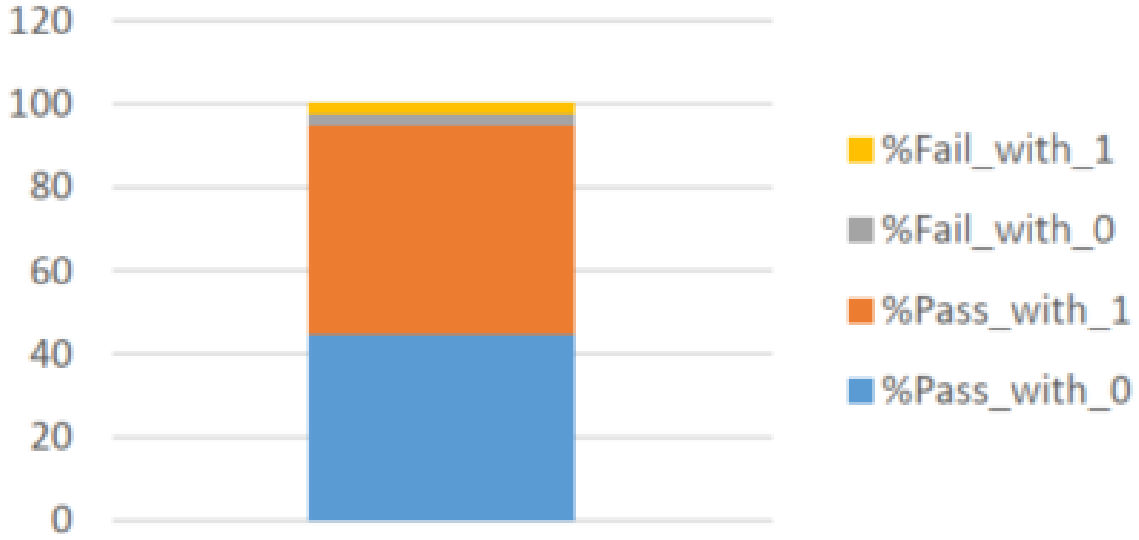


Pass and fail fault persistence time for each memory instance

Results



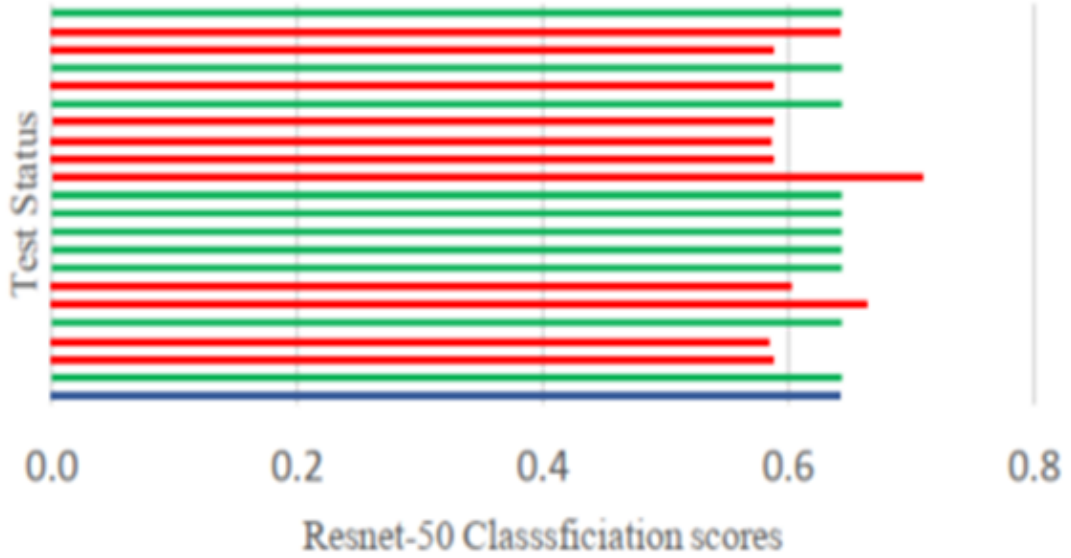
% sims vs fault persistence time (us)



Transient soft error profile with less persistence

Results based on AI

Ground truth image Vs Wrongly Inferred image



Classification scores Vs Test Status

Conclusion

- Fault Injection – one of the accurate ways to model errors and understand the error tolerance or reliability of hardware.
- Input errors rates of 4% to 50% is observed based on error persistence time periods.
- For Shorter transient errors, only 4% of the soft errors result in SDC or failure.
- Image classification using Resnet-50 less than 0.25% of all the error simulations resulted in wrong inference. Numbers vary based on several parameters – Inference type, workload, NN model, input images..etc.
- Usage of AI based methodology helped immensely to understand the impact of SDC in Media Applications.

Thanks
Q & A