Update on development of electric power distribution system resilience modelling toolbox

13th March 2017

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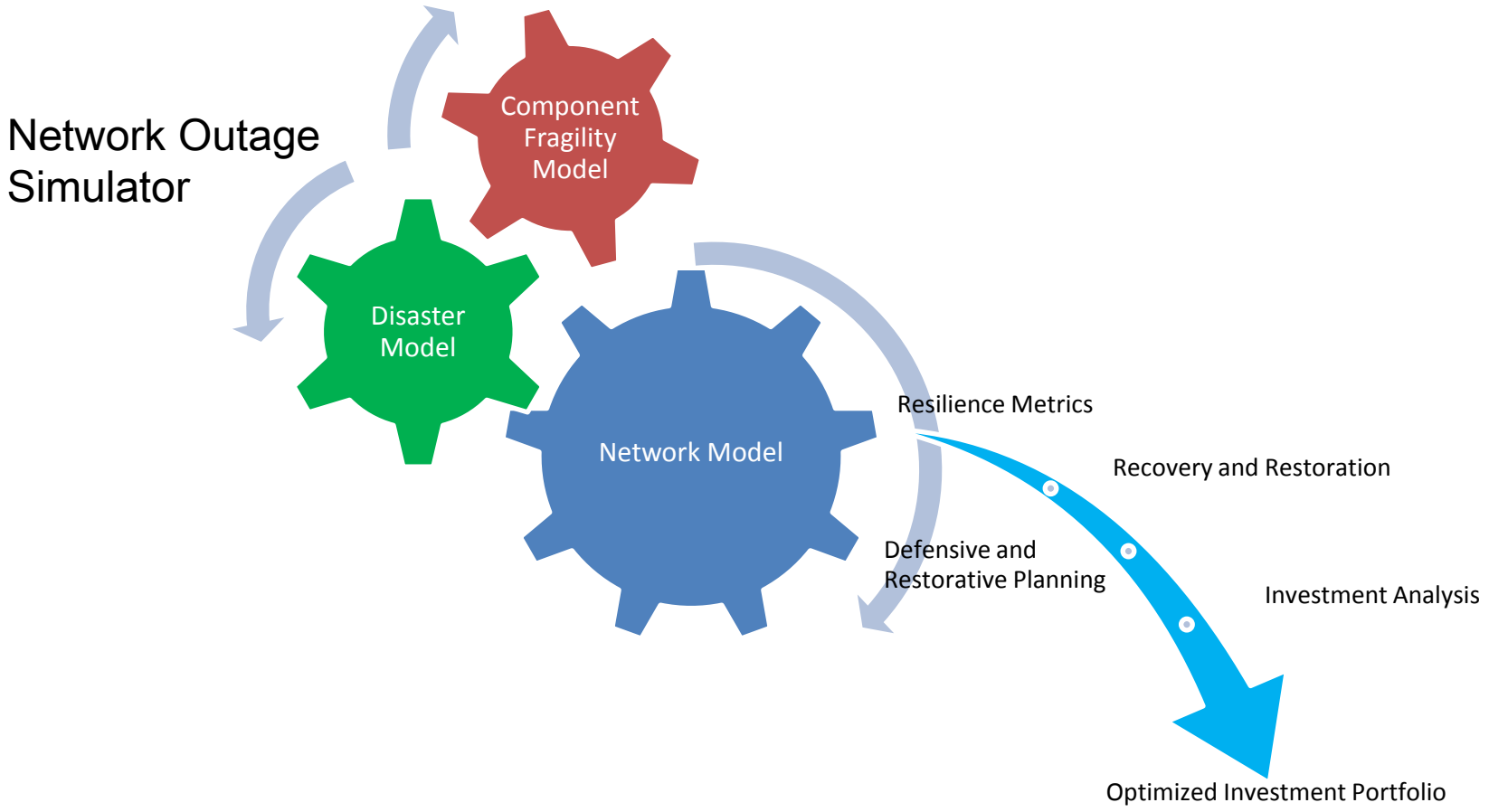
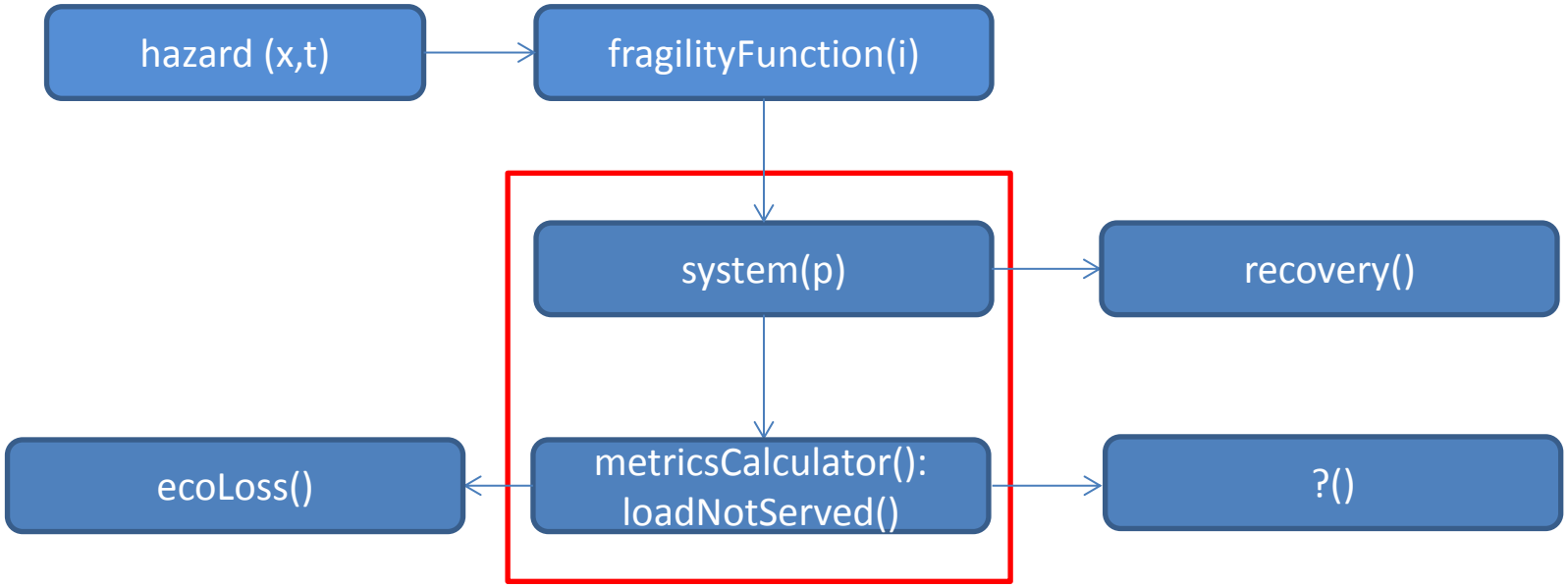
Framework

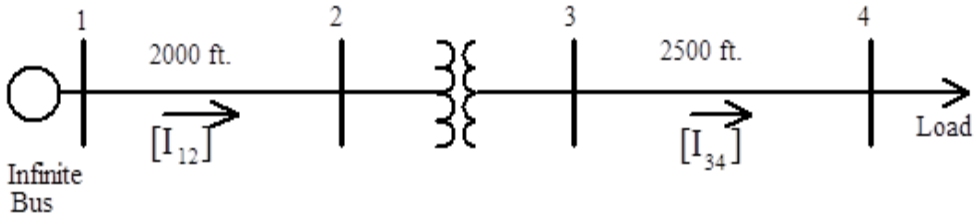

Network Outage Simulator
Component Fragility Model
Disaster Model
Network Model
Resilience Metrics
Recovery and Restoration
Defensive and Restorative Planning
Investment Analysis
Optimized Investment Portfolio

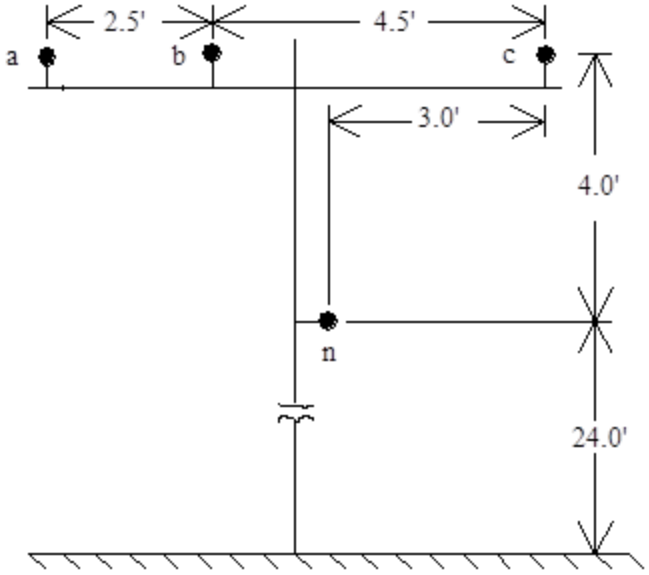
Framework


hazard (x,t)
fragilityFunction(i)
system(p)
recovery()
ecoLoss()
metricsCalculator():
loadNotServed()
?()

Test system – IEEE 4 Node

IEEE 4 Node Test Feeder



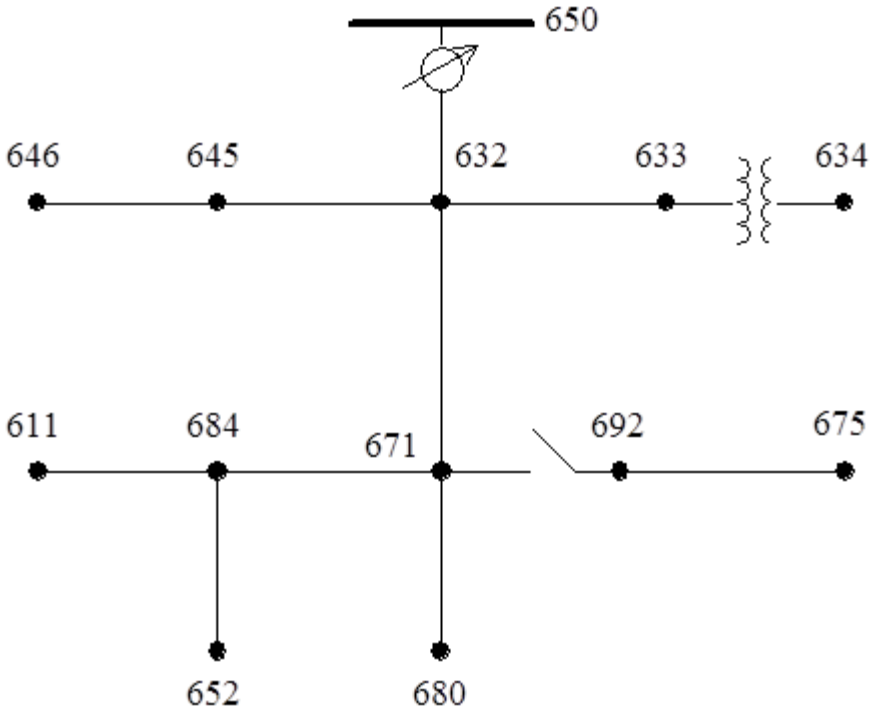


Closed Connections Load Data:

	Balanced	Unbalanced
Phase-1		
kW	1800	1275
Power Factor	0.9 lag	0.85 lag
Phase-2		
kW	1800	1800
Power Factor	0.9 lag	0.9 lag
Phase-3		
kW	1800	2375
Power Factor	0.9 lag	0.95 lag

Test system - IEEE 13 Node

IEEE 13 Node Test Feeder

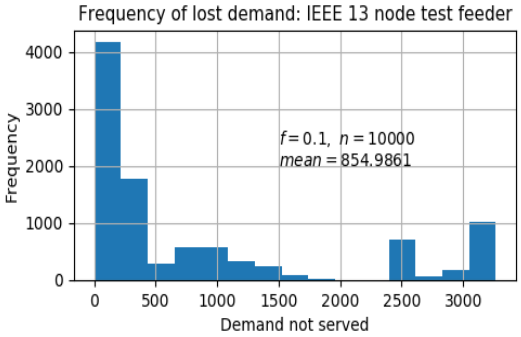


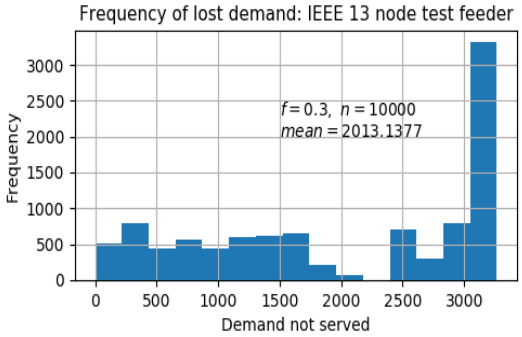
Spot Load Data:

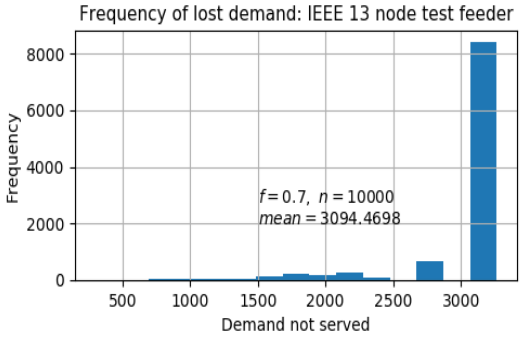
Node	Load	Ph-1	Ph-1	Ph-2	Ph-2	Ph-3	Ph-3
	Model	kW	kVAr	kW	kVAr	kW	kVAr
634	Y-PQ	160	110	120	90	120	90
645	Y-PQ	0	0	170	125	0	0
646	D-Z	0	0	230	132	0	0
652	Y-Z	128	86	0	0	0	0
671	D-PQ	385	220	385	220	385	220
675	Y-PQ	485	190	68	60	290	212
692	D-I	0	0	0	0	170	151
611	Y-I	0	0	0	0	170	80
	TOTAL	1158	606	973	627	1135	753

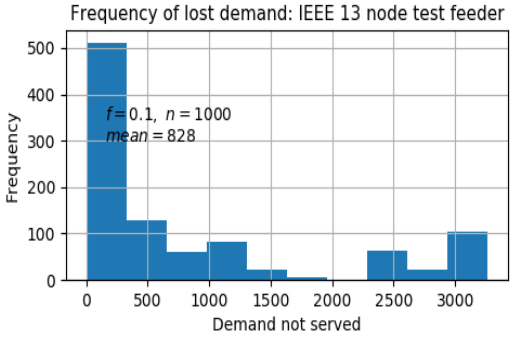
Google: IEEE distribution test feeder
http://www.ewh.ieee.org/soc/pes/dsacom/testfeeders/index.html

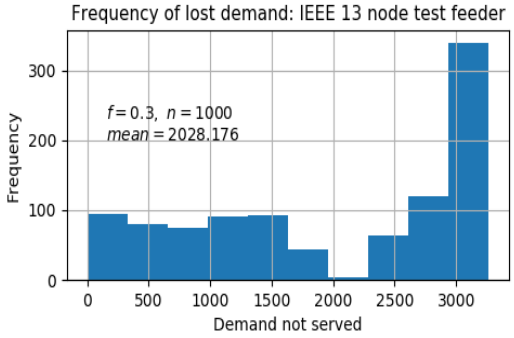
Simulations – Resilience Metrics

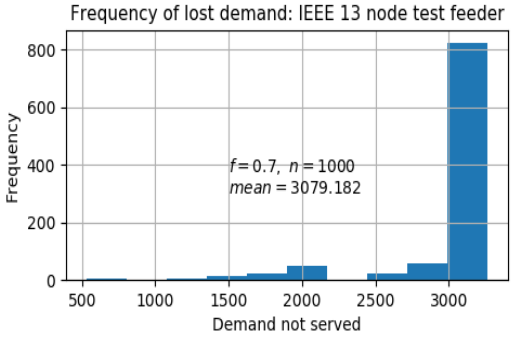


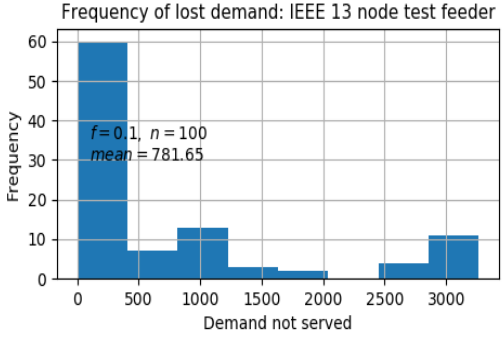


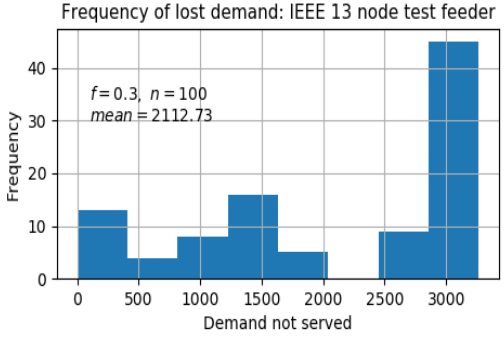


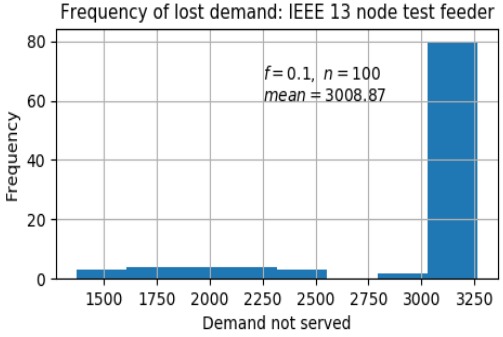




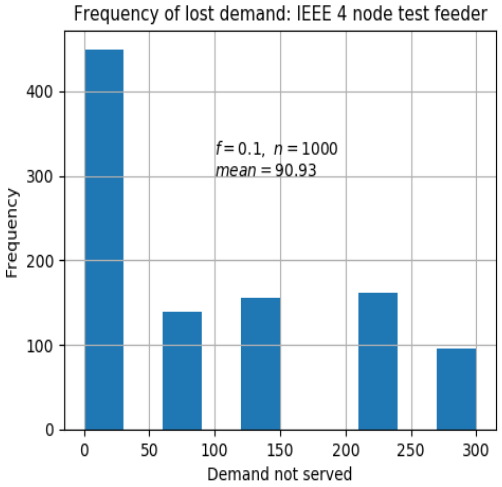


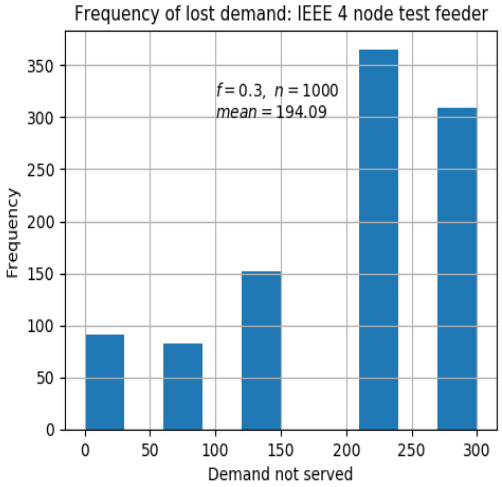


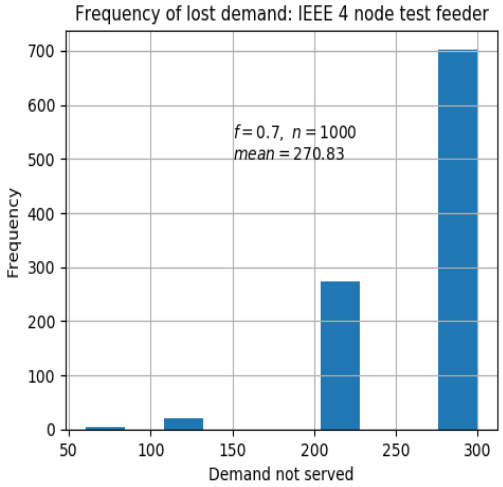


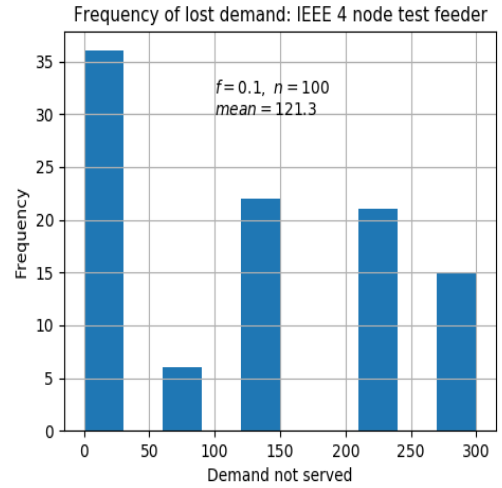


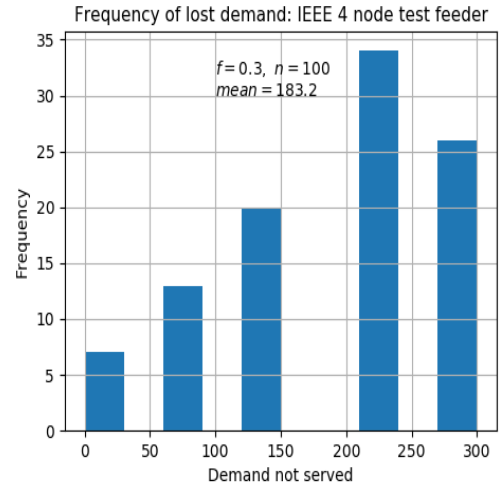
Simulations – Resilience Metrics

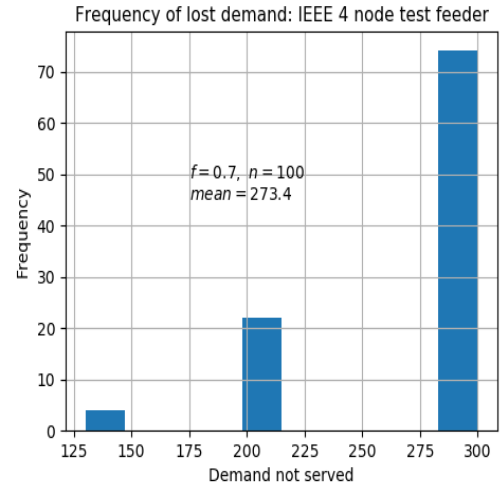




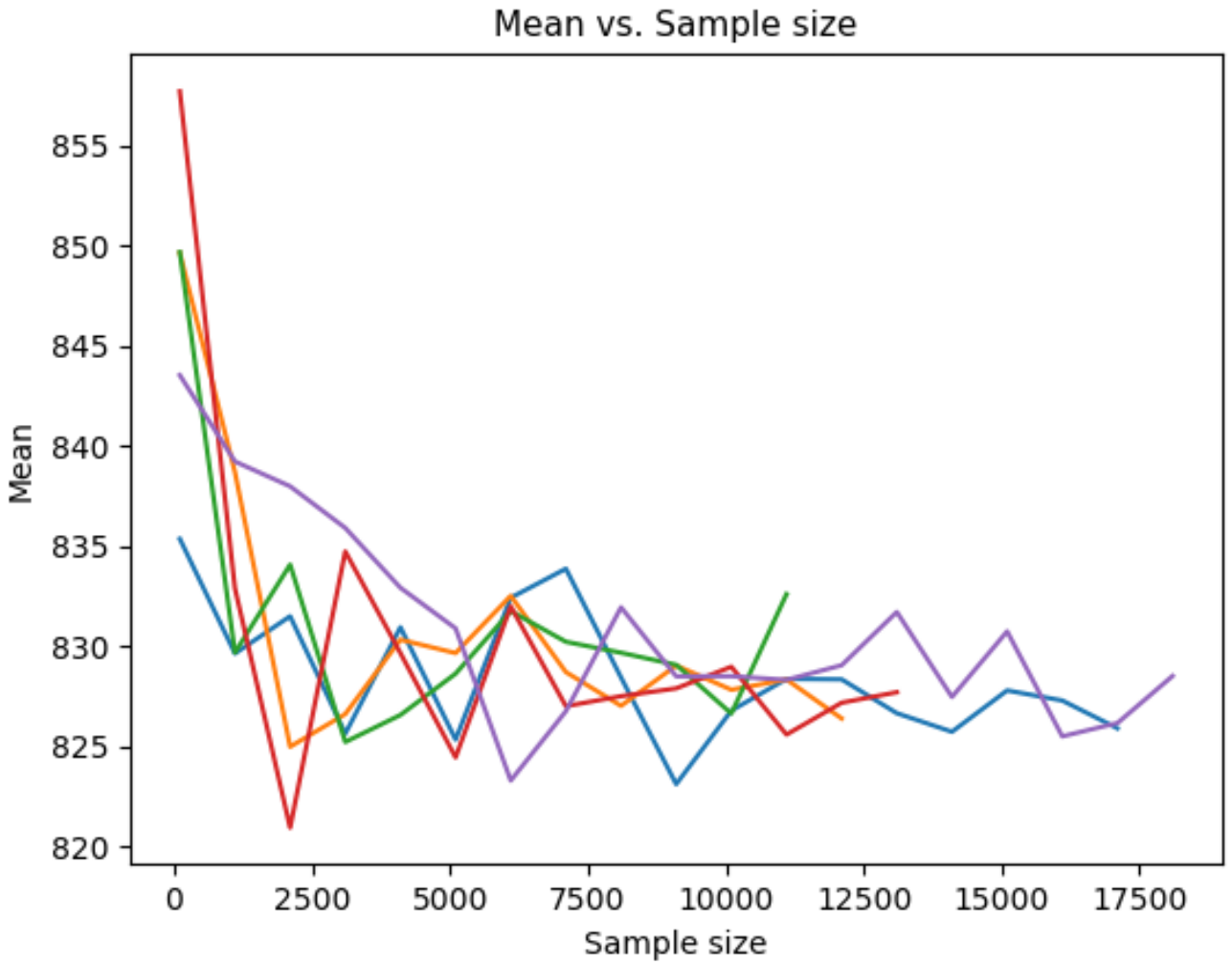








Simulations – Stopping Criteria



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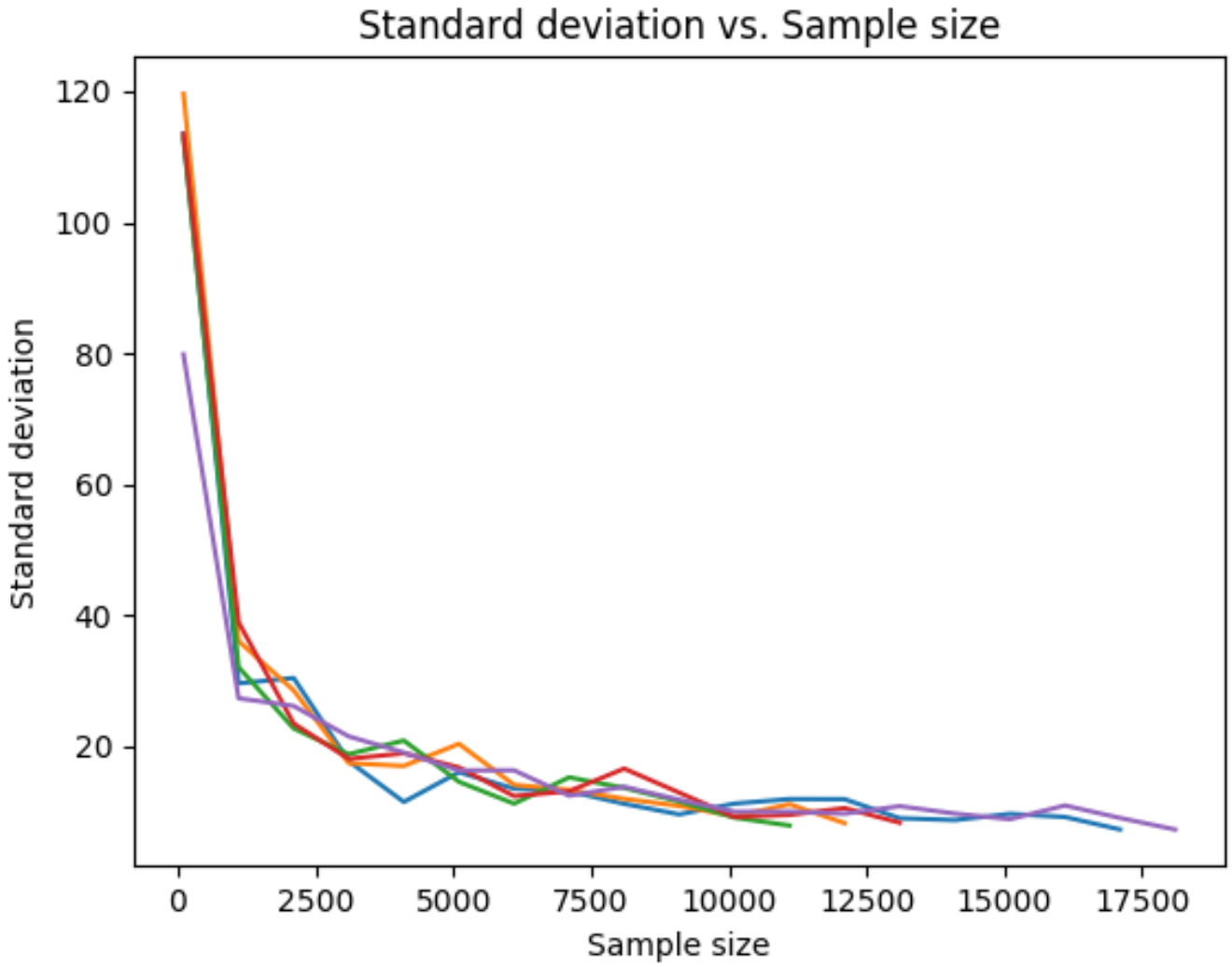

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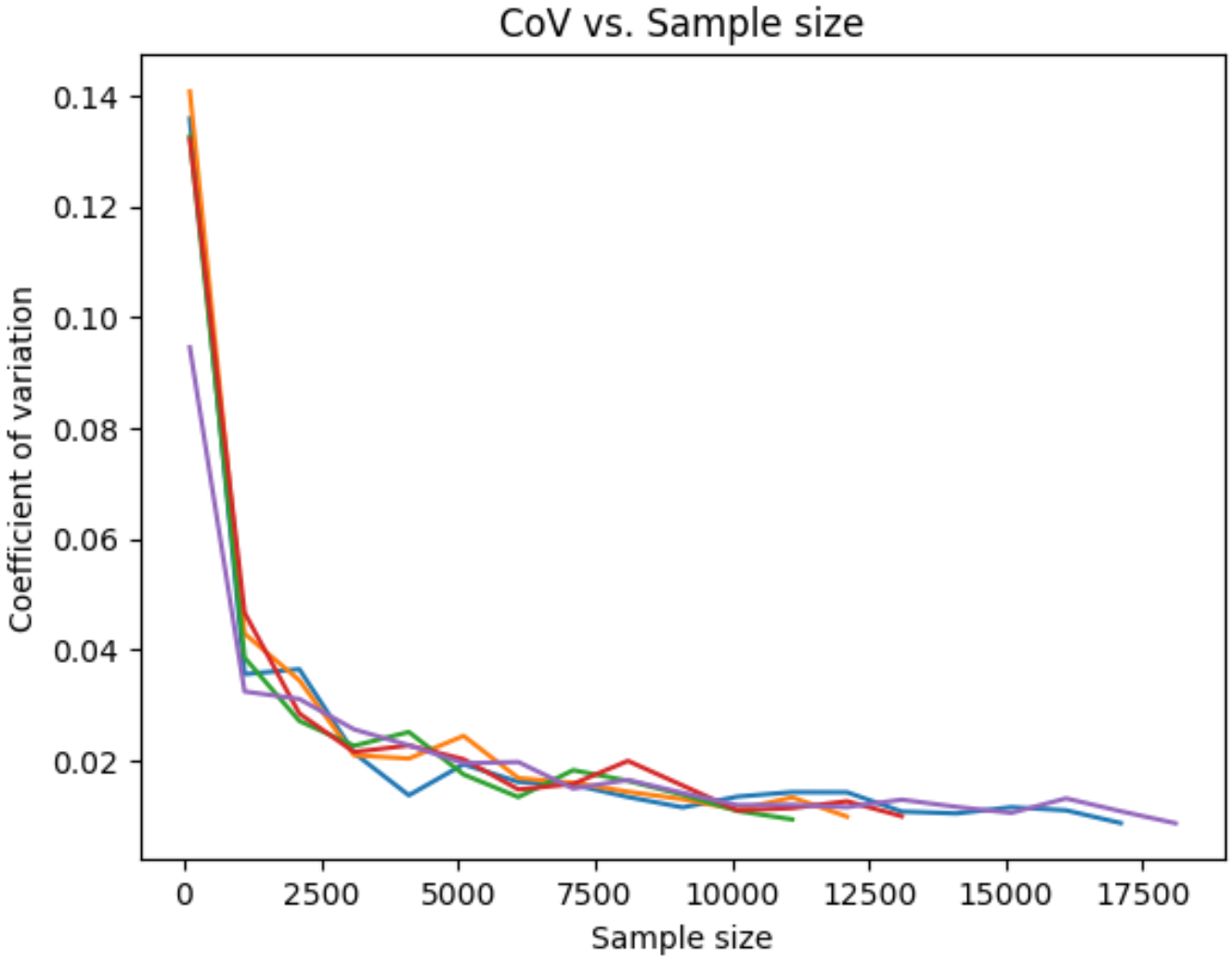

Future works

- Sequential MC simulation
- More metrics
- Implementing it in actual distribution networks