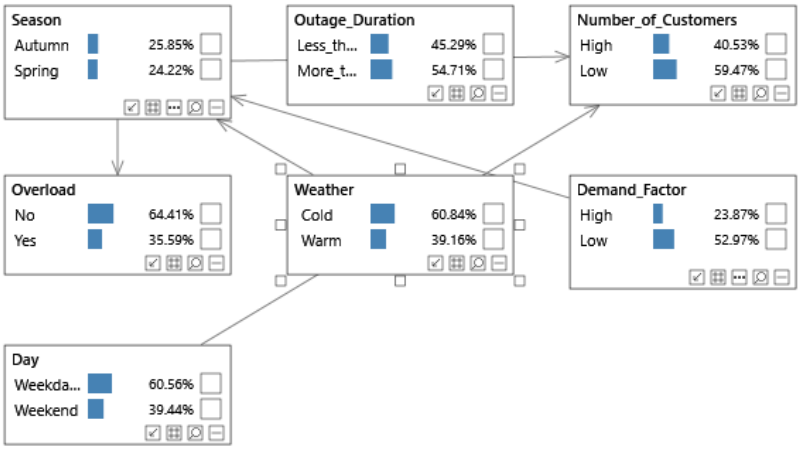
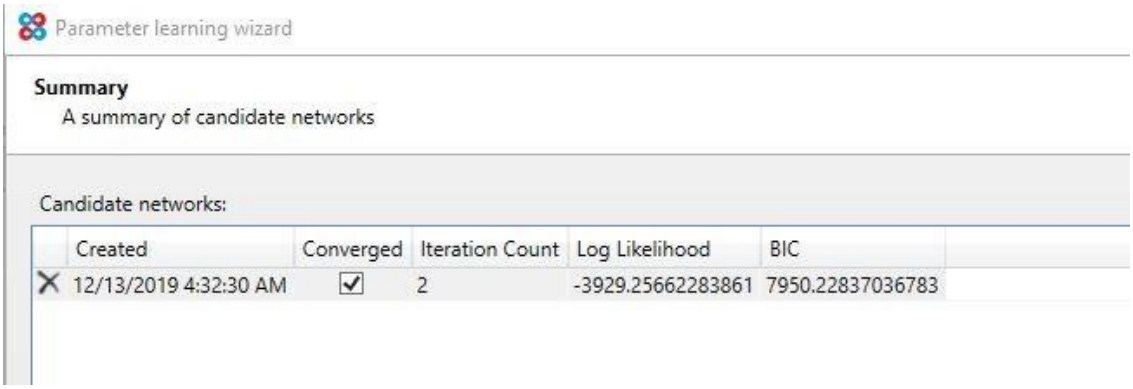
Lab 3:

Bayesian network

Task1:

Connection 1:





Log-likelihood:'

It is a function(natural logarthim) used to measure the maximum likelihood estimator of the parameter.

Likelihood range: **0 to infinity**

Log-likelihood range : - **infinity to infinity**

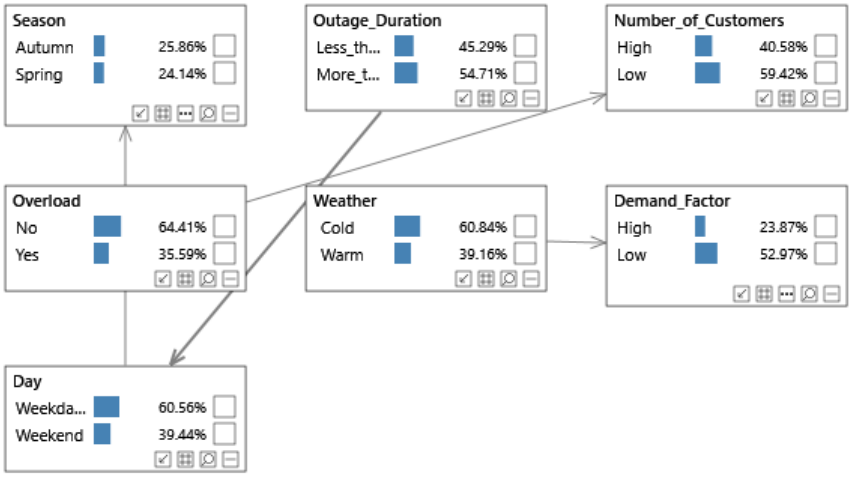
It is used to detect unusual data known as **anomaly detection**.

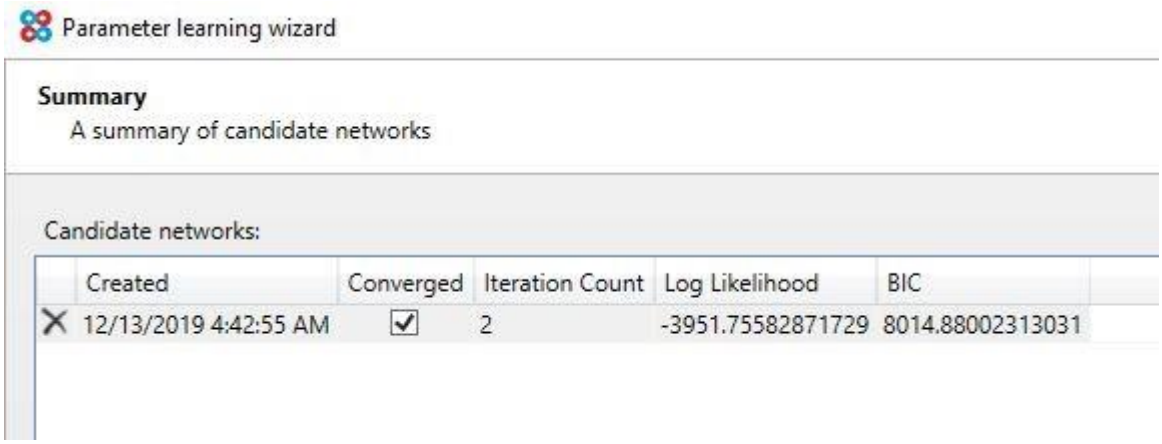
Bayesian Information Criterion(BIC):

The BIC is a criterion used for model selection among the different set of models,models with lowest value is preffered.

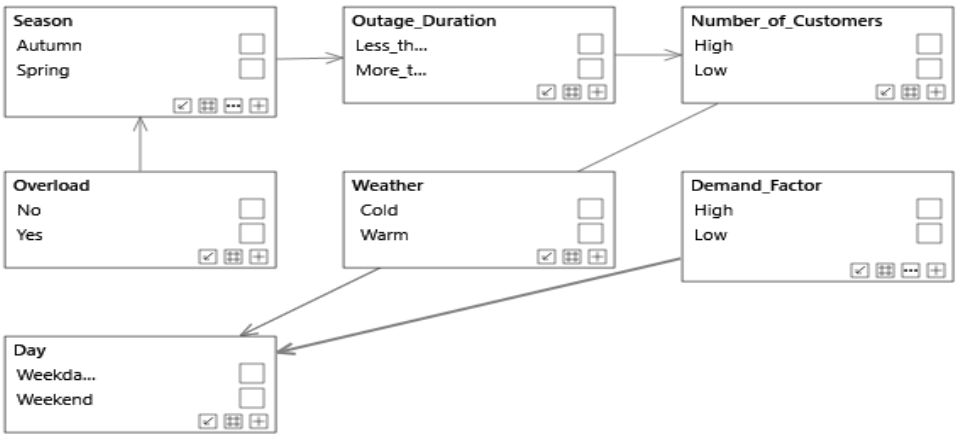
When fitting the model it will increases likelihood value but it will leads to overfitting .

Connection 2:





Connection 3:



Parameter learning wizard

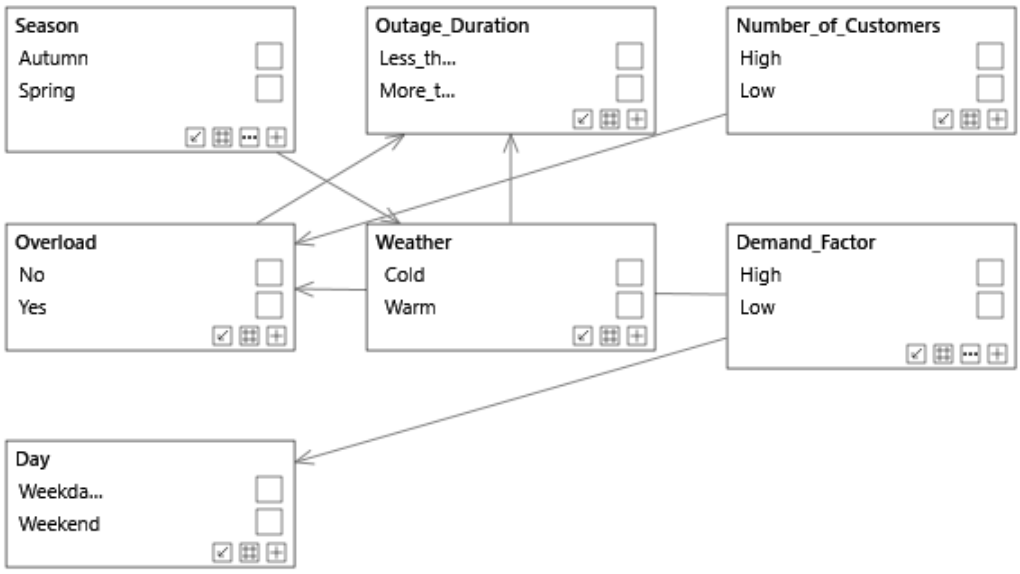
Summary

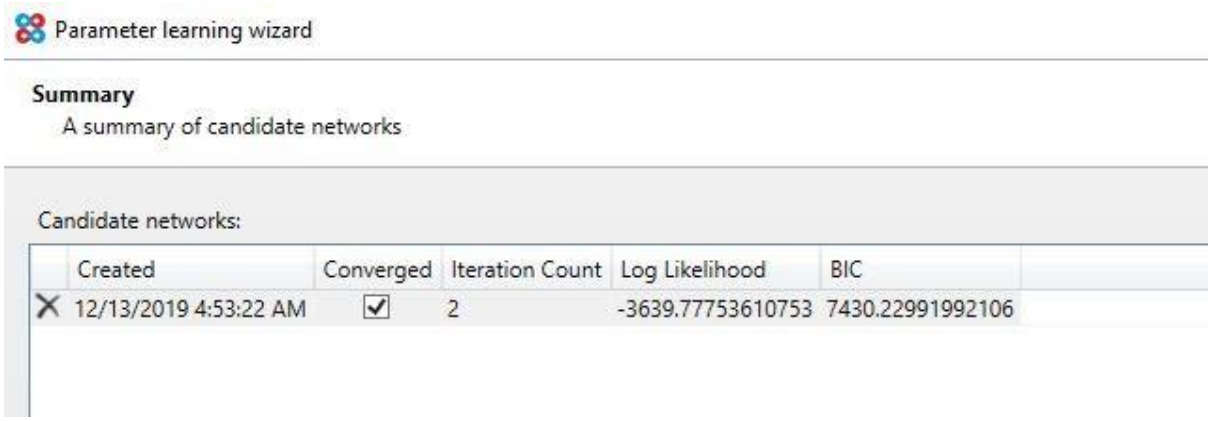
A summary of candidate networks

Candidate networks:

	Created	Converged	Iteration Count	Log Likelihood	BIC
✕	12/13/2019 4:46:51 AM	☑	2	-3939.37045276374	8062.1711549087

Connection 4(Structural connection):





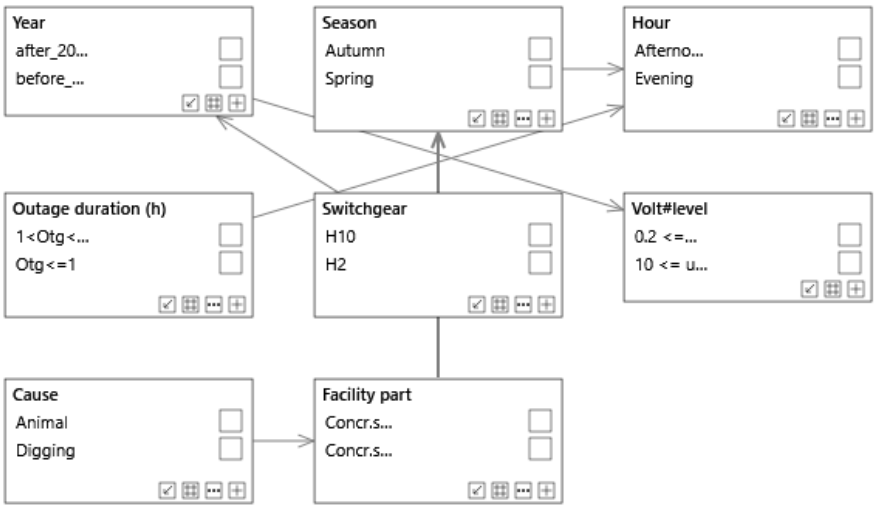
From all the above connection the connection 2 have log-likelyhood value(3951.75) is high but the problem is BIC value for connection 2 is 8014.88 .

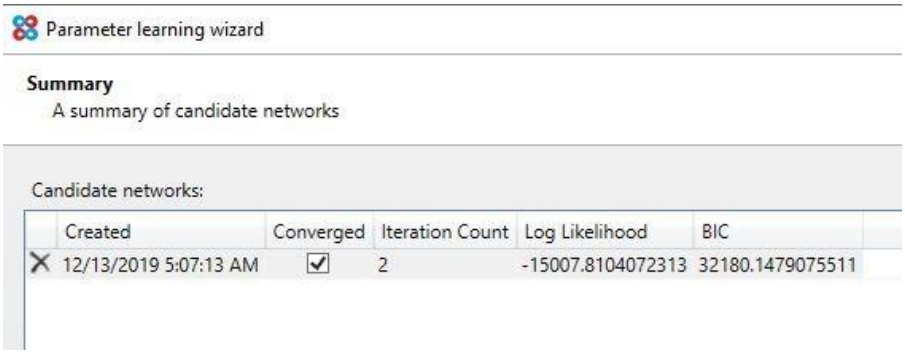
For a good network the BIC should be low if it is high means the model is overfitting.

In structural connection BIC is 743.229 which is low when compared to connection 2 this model is the best.

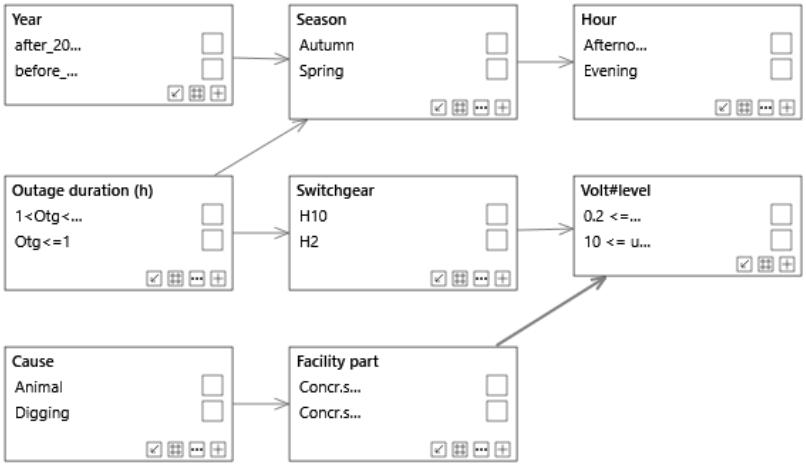
Task2

Connection 1:





Connection 2:



Parameter learning wizard

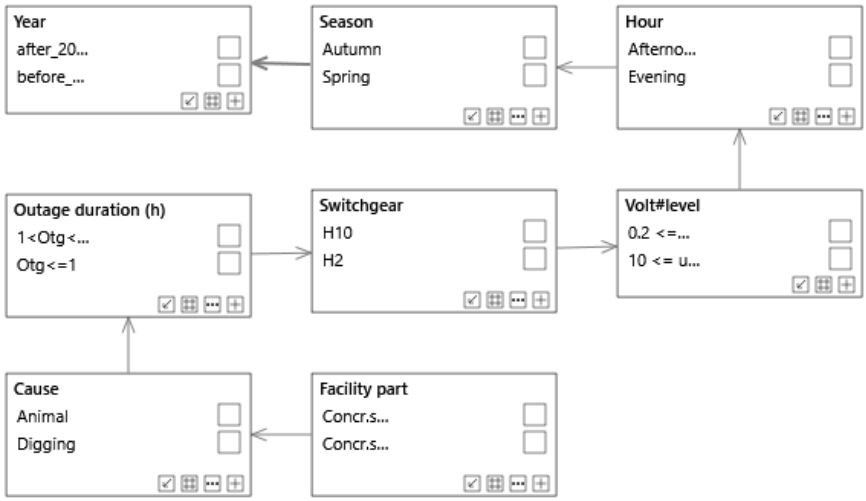
Summary

A summary of candidate networks

Candidate networks:

	Created	Converged	Iteration Count	Log Likelihood	BIC
✕	12/13/2019 5:09:53 AM	☑	2	-14754.6488192505	32014.8118763911

Connection 3:



Parameter learning wizard

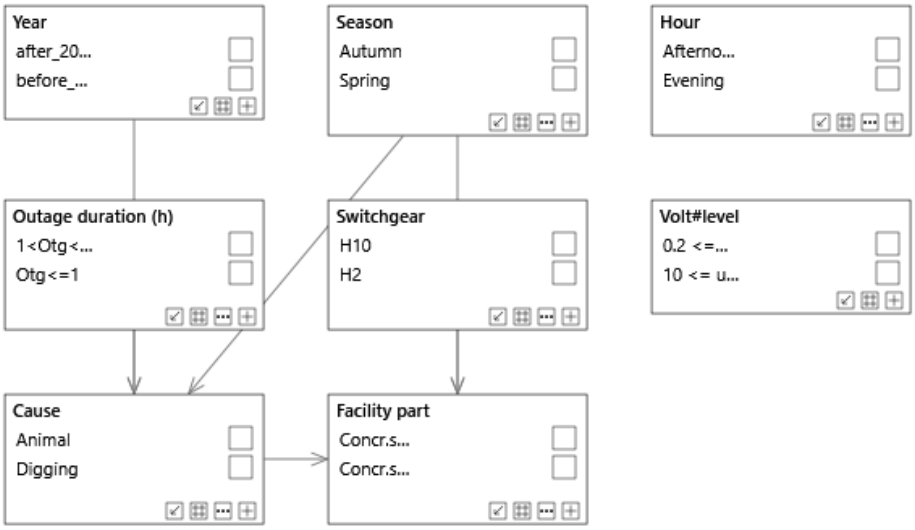
Summary

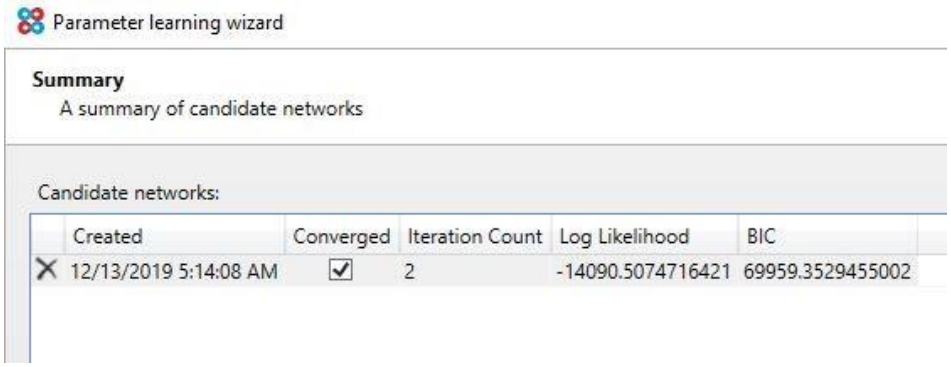
A summary of candidate networks

Candidate networks:

	Created	Converged	Iteration Count	Log Likelihood	BIC
✕	12/13/2019 5:12:19 AM	☑	2	-14821.8229574935	31748.8708959361

Connection 4(Structural connection):





Task 2(b):

1. p(Cause=Animal | Season=Autumn)= 0.81%

2. p(Season=Autumn | Cause=Animal)= 33.64%

3. p(Season=Summer | Cause=Thunder)= 75.33%

4. p(Outage duration=Otg ≤ 1 | Facility part = Ground cable pillar)= 29.85%

5. p(Facility part=Ground cable pillar | Switchgear=H7, Cause=Fuse break)= 81.79%

6. p(Facility part=Ground feeder cable in ground|Cause=(Digging, Fabrication fault), Switchgear=H7, Season=Summer)= 49.61%

7. p(Facility part=Ground feeder cable in ground | Cause=¬(Digging, Fabrication fault), Switchgear=H7, Season=Summer)= 27.08%

8. p(Cause=Digging | Facility part = OH line, Switchgear=H7)= 0%

9. p(Facility part = Ground cable pillar | Outrage duration=Otg > 2)= 45.21%

10. p(Cause=Unknown | Year=before2011) p(Cause=Unknown | Year=after2011) = 2.46%

Task2(c):

1.p(cause=animal|hour=evening) =0.54%

2.p(switchgear=H2|year=before) =2.36%

3.p(switchgear=H10|volt#level=0.2< =u <=1.0) =15.27%

4.p(season=spring|cause=animal) = 22.97

5.p(season=autumn|wheather=cold) = 28.63%

6.p(Demanfactor=High|wheather=warm) = 23.87%

7.p(demandfactor=high|wheather=~(warm),demandfactor=low) = 0%

8.p(overload=yes|season=autumn,wheather=~(warm)) = 35.30%

9.p(cause=digging|switchgear=~(H10), year=after) = 17.42%

10.p(cause=digging|Facility part=OH line,switch gear=~(H7)) = 0.92%

Task 2(d):

The probability of the dependes on it's childs if the child probability changes the probability of it's parents also changes

Task 2(e):

If Fabrication fault is afailure means if we maximize these attributes will change a lot(Ground cable pillar, Ground feeder cable in ground, Ground cable fuse/apparatus box).

Task 2(f) :

Positive correlation:

P(Facility part =Ground cable pillar|season=winter) = 60.17%

P(Facility part= OH line |cause = Animal) = 17.85%

P(Facility part= Other secondary substation |cause= Animal) = 8.97%

Negative correlation:

P(Facility part=Ground cable fuse/ apparatus box |cause= Digging) =1.19%

P(Facility part =Ground cable feeder in ground | season =winter)=18.95%

P(Facility part= Ground cable pillar |Cause = Animal) =4.15%