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Asurion Service Quality and Time Analysis

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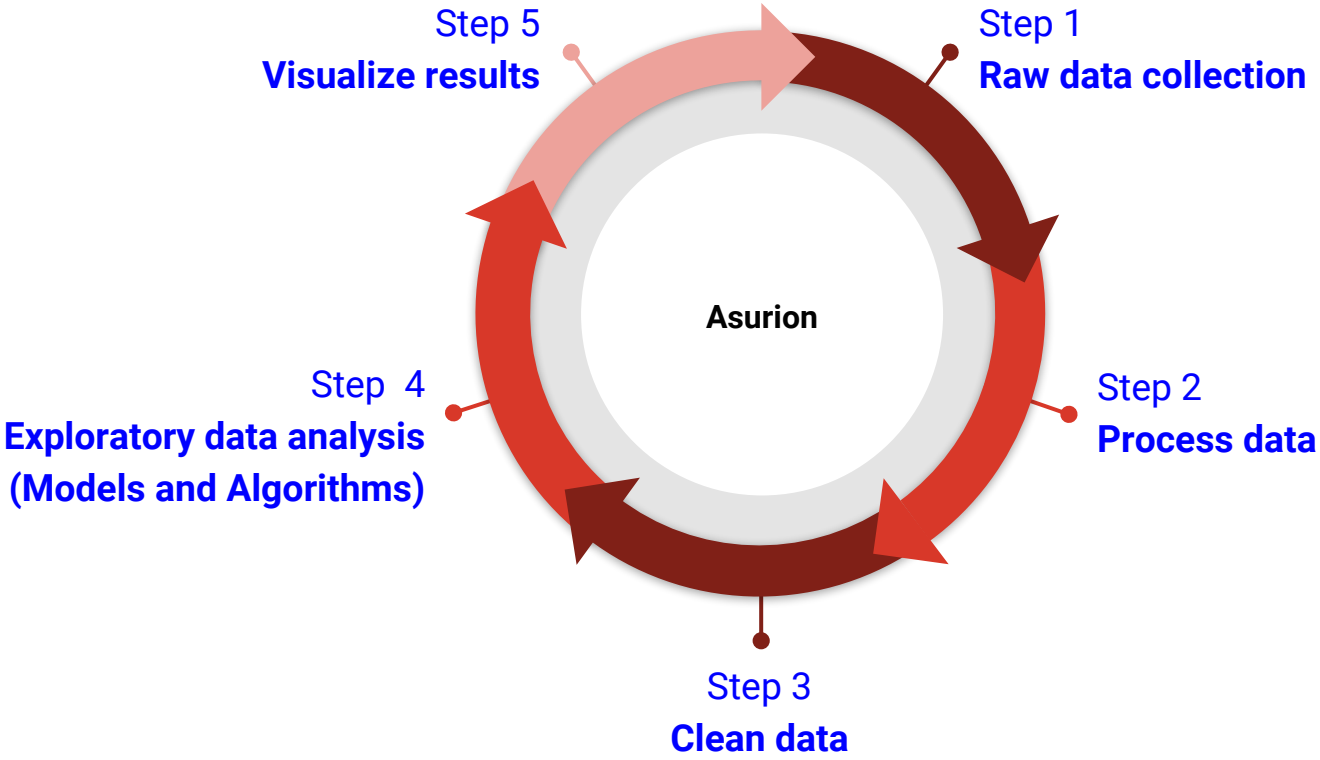
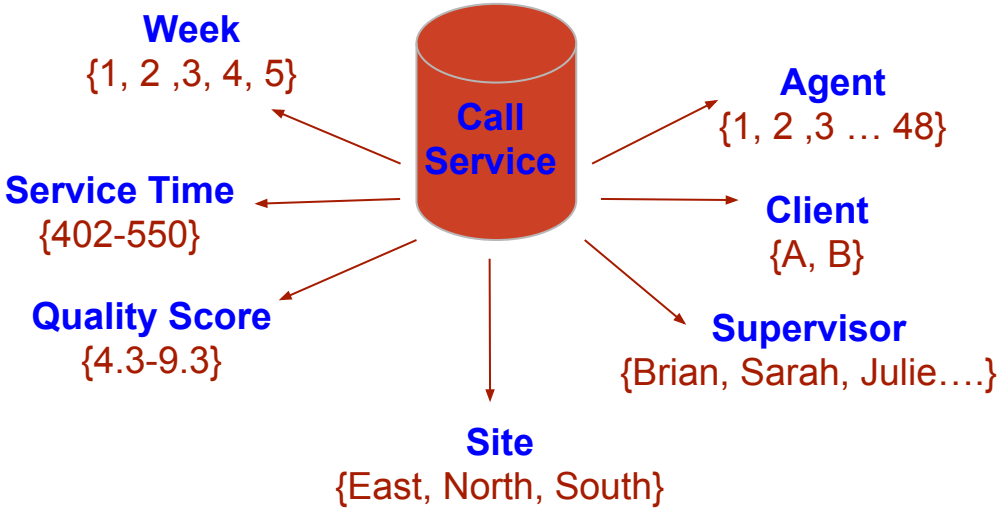
Introduction

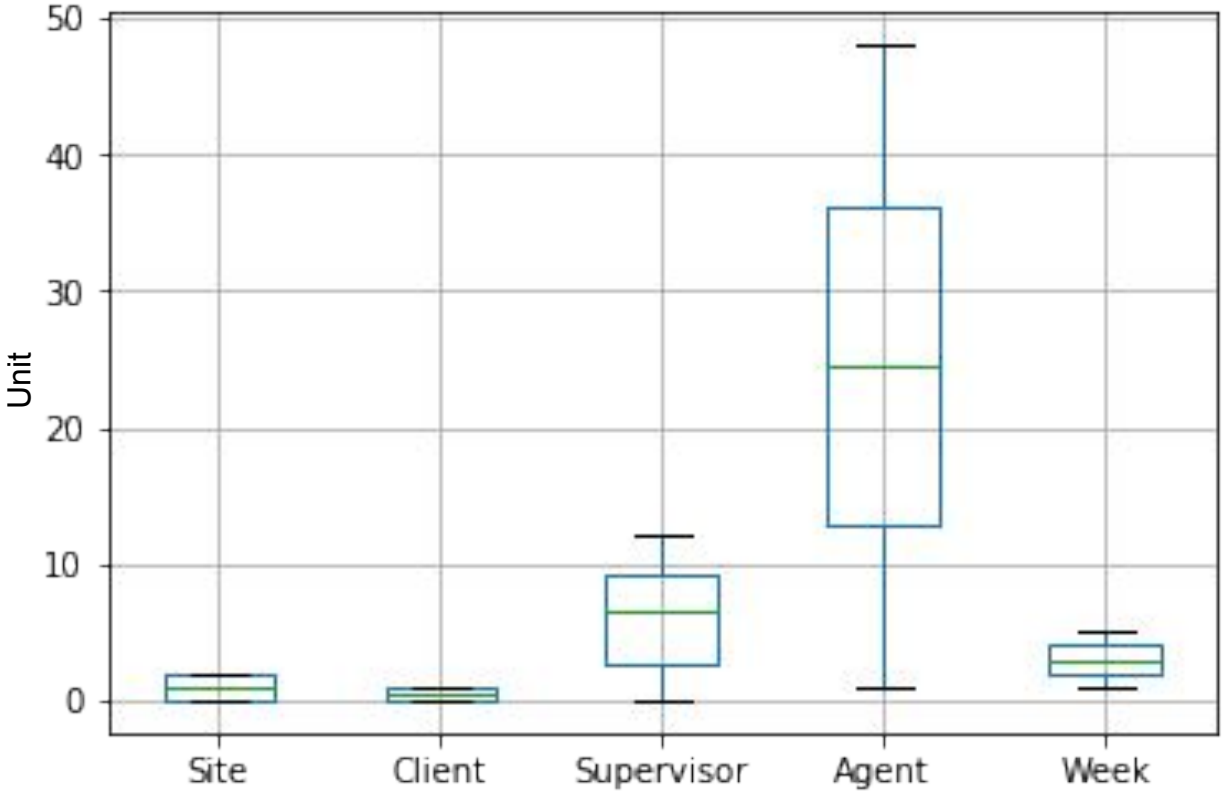


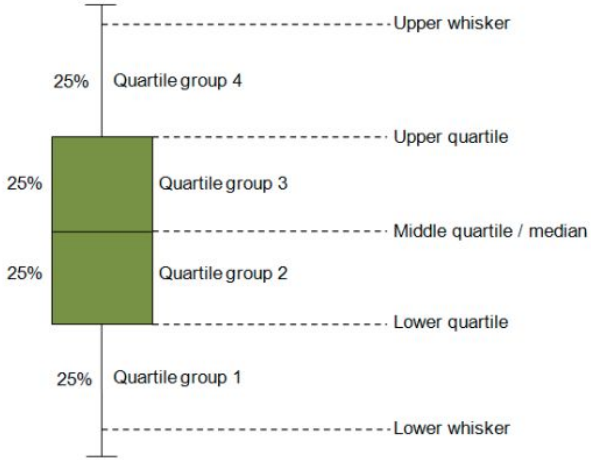
Call Service Dataset



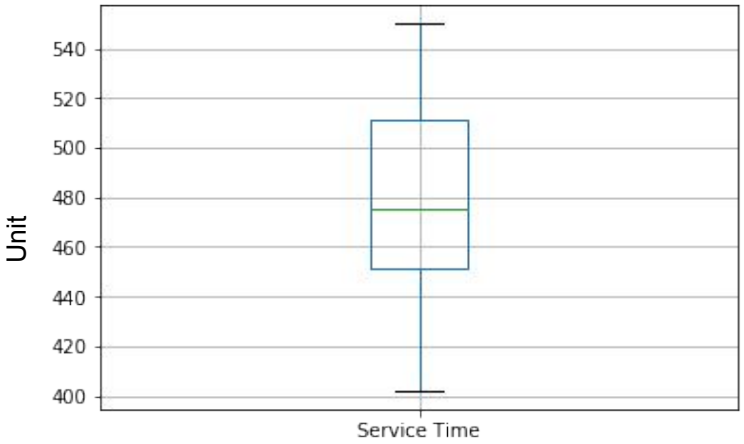
	Agent	Week	Service Time	Quality Score
count	240.000000	240.000000	240.000000	240.000000
mean	24.500000	3.000000	475.120833	6.895299
std	13.882351	1.417169	39.497974	1.206823
min	1.000000	1.000000	402.000000	4.300000
25%	12.750000	2.000000	451.000000	5.900000
50%	24.500000	3.000000	475.000000	6.900000
75%	36.250000	4.000000	511.000000	7.700000
max	48.000000	5.000000	550.000000	9.300000

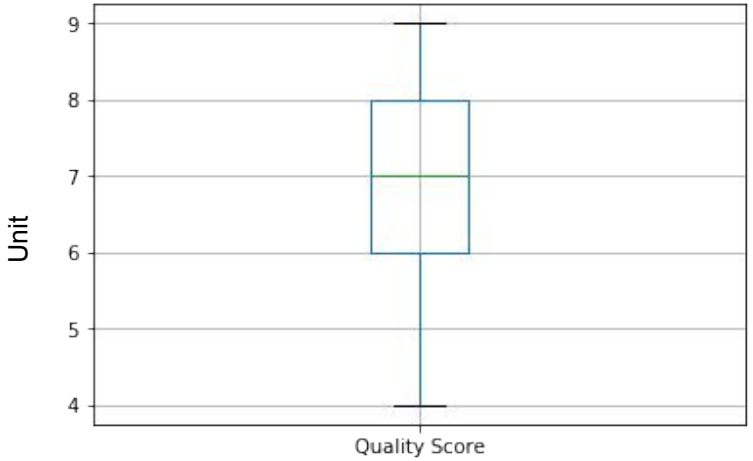
Dataset Features: Input

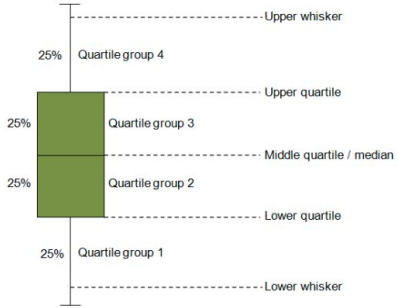




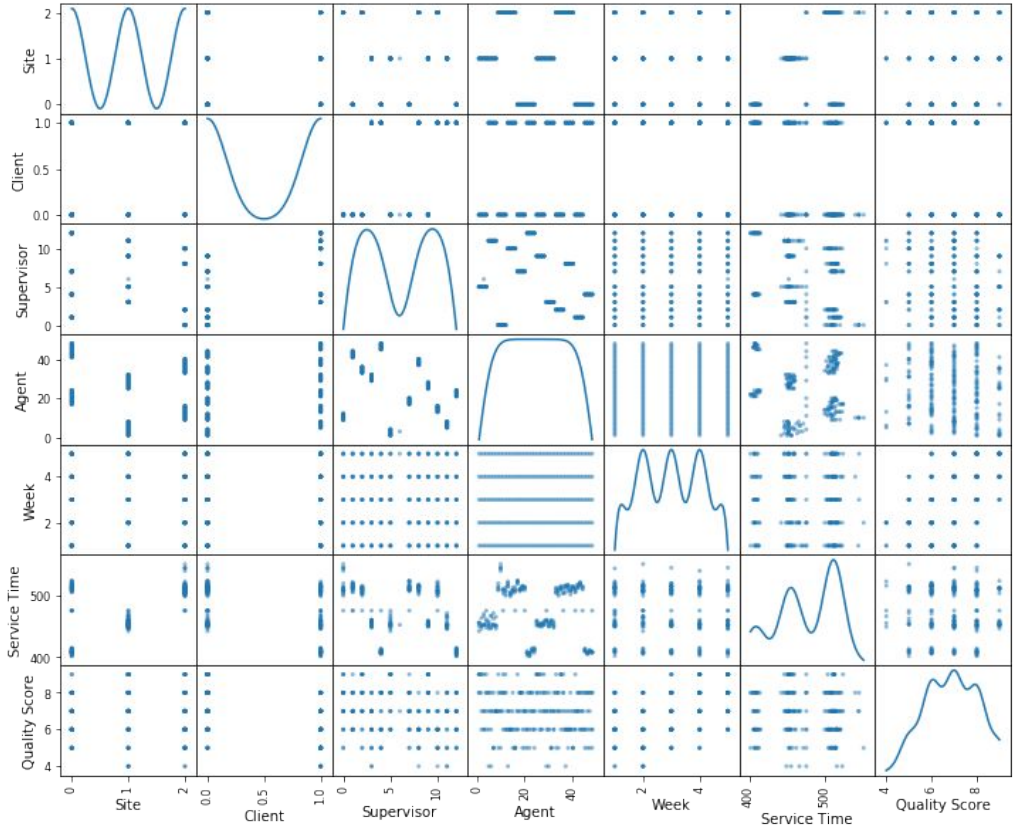
Dataset Features: Output







Data visualization



Scatter plot

- Diagonals: Density plot for each feature

Data preprocessing

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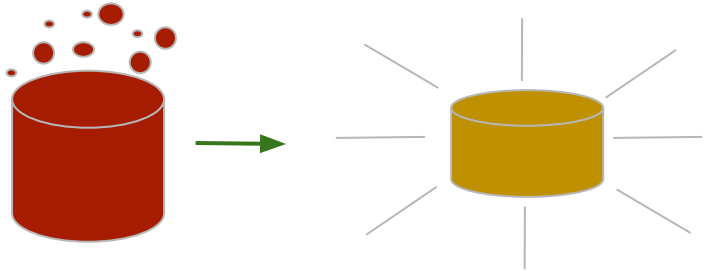
01	**Handle missing data**	• Single value imputation • Substitute by the mean value • No data loss
02	**Handle error introduced from manual data entry**	• Spelling errors Jorrge, Jorge; Sara, Sarah • Similarity score (using SequenceMatcher) • Similarity Score > 80% : **Replace** • No data loss
03	**Data Transformation**	• Label encoding [North, East, West] -> [0,1,2] • Reducing number of bins for Quality Score, Service Time [6.5,6.3,7.2] ->[6,6,7] • Further reducing bins to form only 2 categories

Data Cleaning



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- Handle missing data
  - Perform single value imputation on missing data (NaN)
  - Substitute missing data by the mean value
  - Ensures there is no data loss

- Handle errors in data
  - Spelling errors Jorrge, Jorge; Sara, Sarah
  - Similarity score (using SequenceMatcher)
  - Similarity Score > 80% : **Replace**
  - Ensures there is no data loss

Data Transformation

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	Site	Client	Supervisor	Agent	Week	Service Time	Quality Score
0	East	A	Brian	41	1	509.0	6.5
1	East	A	Brian	41	2	505.0	6.9
2	East	A	Brian	41	3	475.0	5.9
3	East	A	Brian	41	4	505.0	7.1
4	East	A	Brian	41	5	511.0	9.1

Label Encoding

	Site	Client	Supervisor	Agent	Week	Service Time	Quality Score
0	0	0	1	41	1	509.0	6.5
1	0	0	1	41	2	505.0	6.9
2	0	0	1	41	3	475.0	5.9
3	0	0	1	41	4	505.0	7.1
4	0	0	1	41	5	511.0	9.1

Correlation among features

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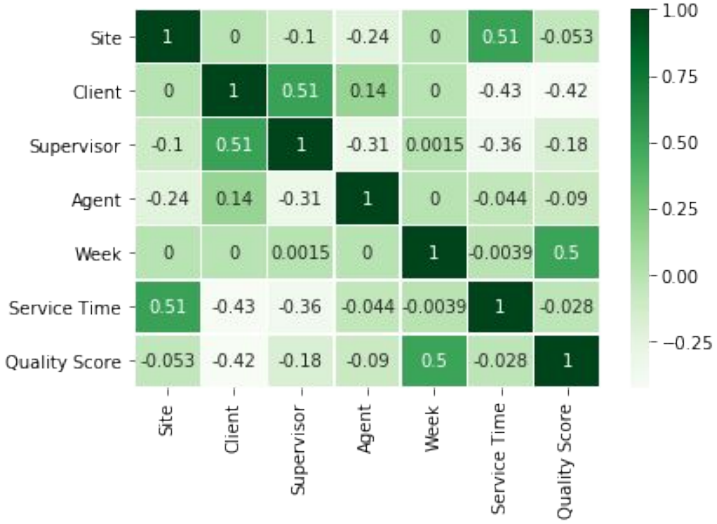
Heatmap



1.00 : Perfect linear relation
0.75-0.99 : Strong linear relation
0.50-0.74: Moderate strong
0.01-0.49: Weak linear relation
0: No linear relation

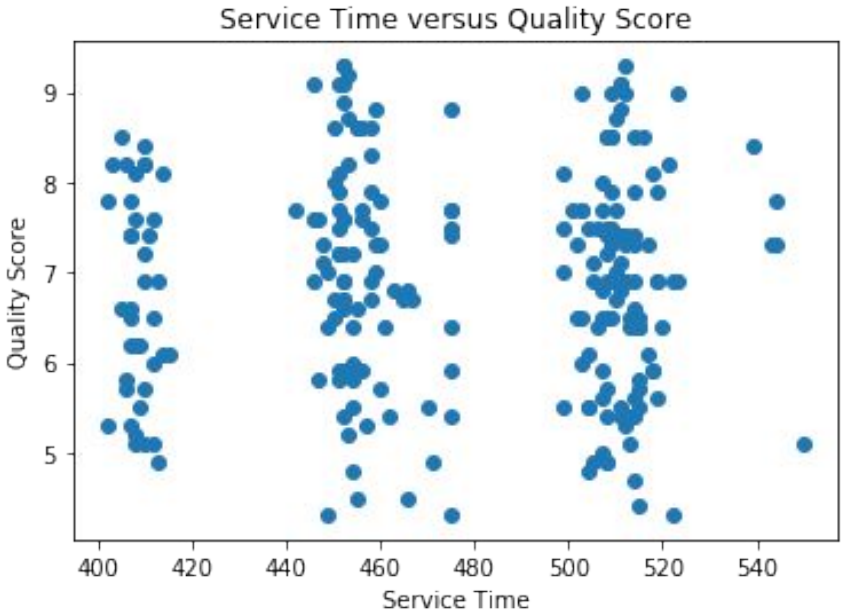
Pearson Method

	Site	Client	Supervisor	Agent	Week	Service Time	Quality Score
Site	1.0	0.0	-0.1	-0.24	0.0	0.51	-0.053
Client	0.0	1.0	0.51	0.14	0.0	-0.43	-0.42
Supervisor	-0.1	0.51	1.0	-0.31	0.0015	-0.36	-0.18
Agent	-0.24	0.14	-0.31	1.0	0.0	-0.044	-0.09
Week	0.0	0.0	0.0015	0.0	1.0	-0.0039	0.5
Service Time	0.51	-0.43	-0.36	-0.044	-0.0039	1.0	-0.028
Quality Score	-0.053	-0.42	-0.18	-0.09	0.5	-0.028	1.0

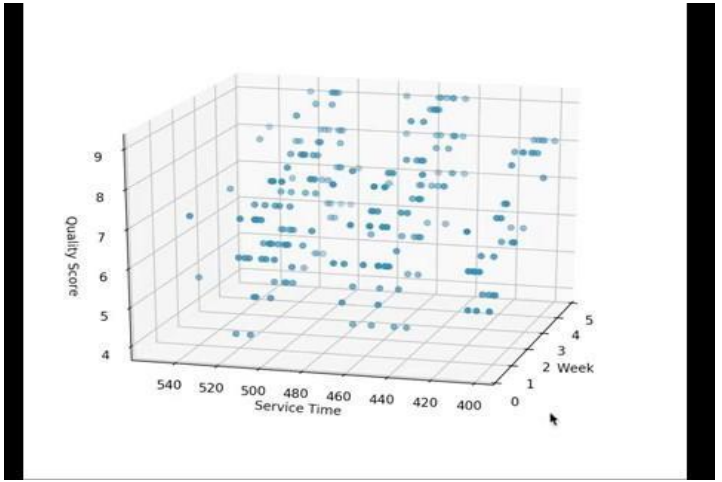
Spearman Method

	Site	Client	Supervisor	Agent	Week	Service Time	Quality Score
Site	1.0	0.0	-0.12	-0.24	0.0	0.4	-0.056
Client	0.0	1.0	0.53	0.14	0.0	-0.39	-0.41
Supervisor	-0.12	0.53	1.0	-0.31	0.00085	-0.39	-0.17
Agent	-0.24	0.14	-0.31	1.0	0.0	0.028	-0.096
Week	0.0	0.0	0.00085	0.0	1.0	-0.019	0.5
Service Time	0.4	-0.39	-0.39	0.028	-0.019	1.0	-0.066
Quality Score	-0.056	-0.41	-0.17	-0.096	0.5	-0.066	1.0

Findings: Service Time vs Quality Score

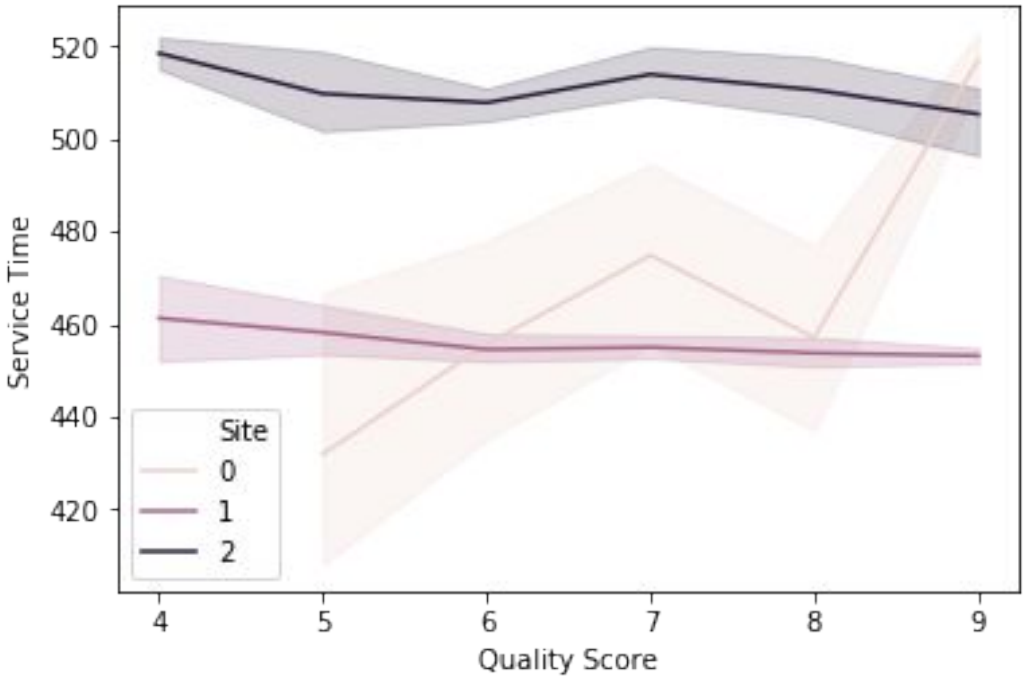


Service Time versus Quality Score and Week



Click above

Findings: Quality Score vs Site



Insight

Service time for:
Site 1: 440-480
Site 2: 475-550

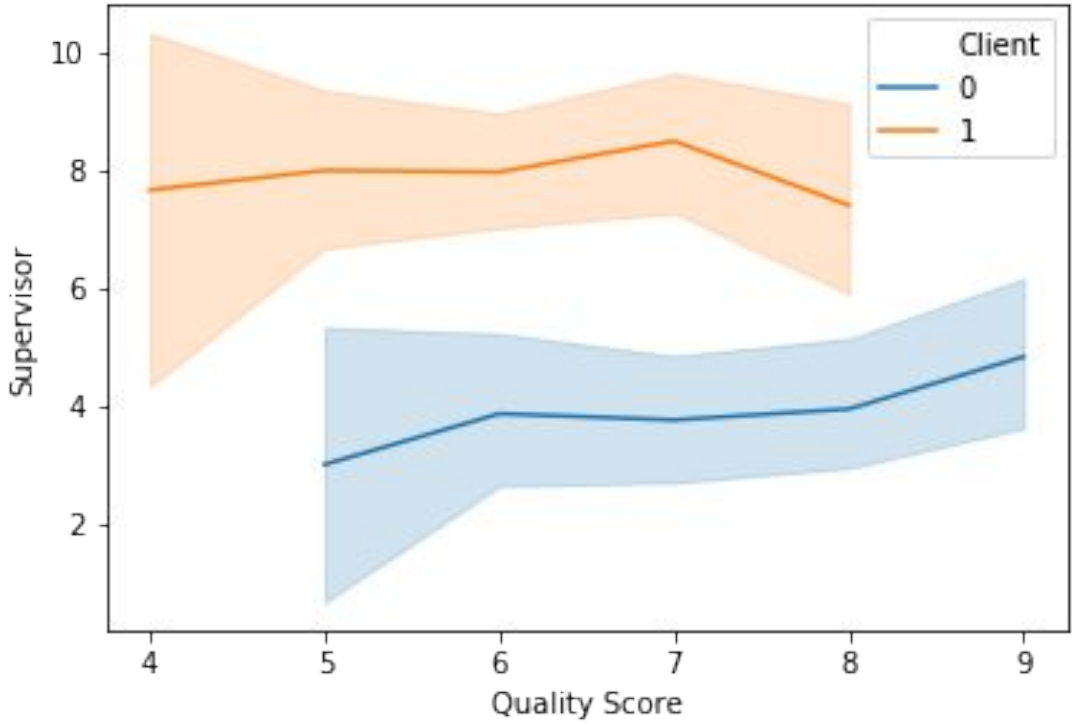
Are there different kinds of services for different sites?

Insight

Site 0: Increase in Service time -> Increase in Quality Score

Does type of service affect Quality Score?

Findings: Quality Score vs Client

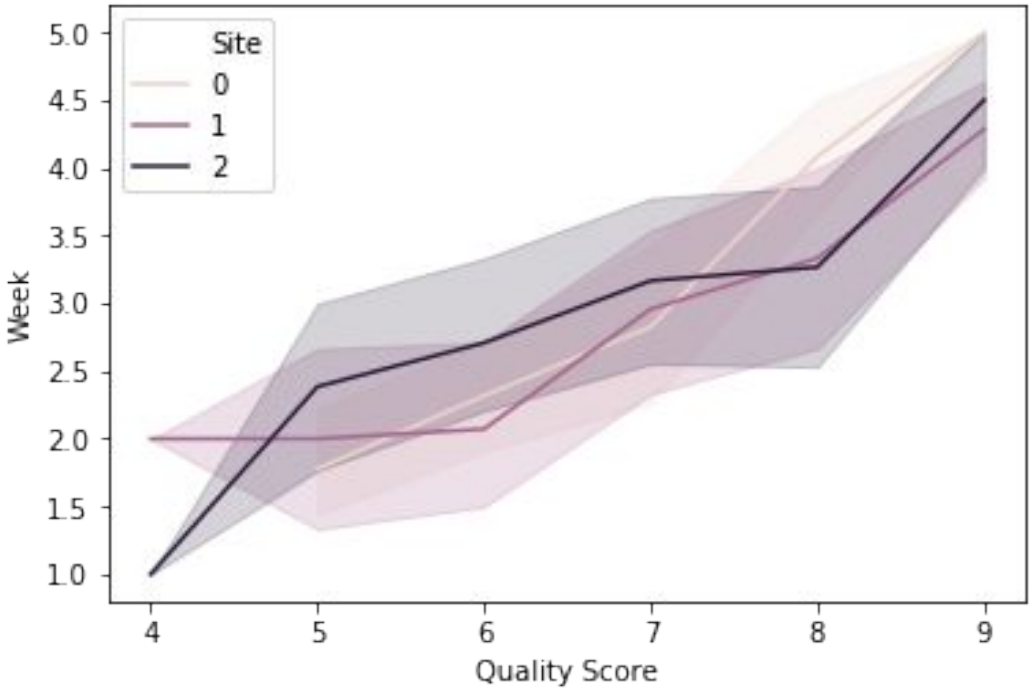


Insight

Quality Score varies with Client
Client 0: Score 5-9 **(Better)**
Client 1: Score 4-8

Will Quality Score vary for each new client?

Findings: Quality Score vs Week

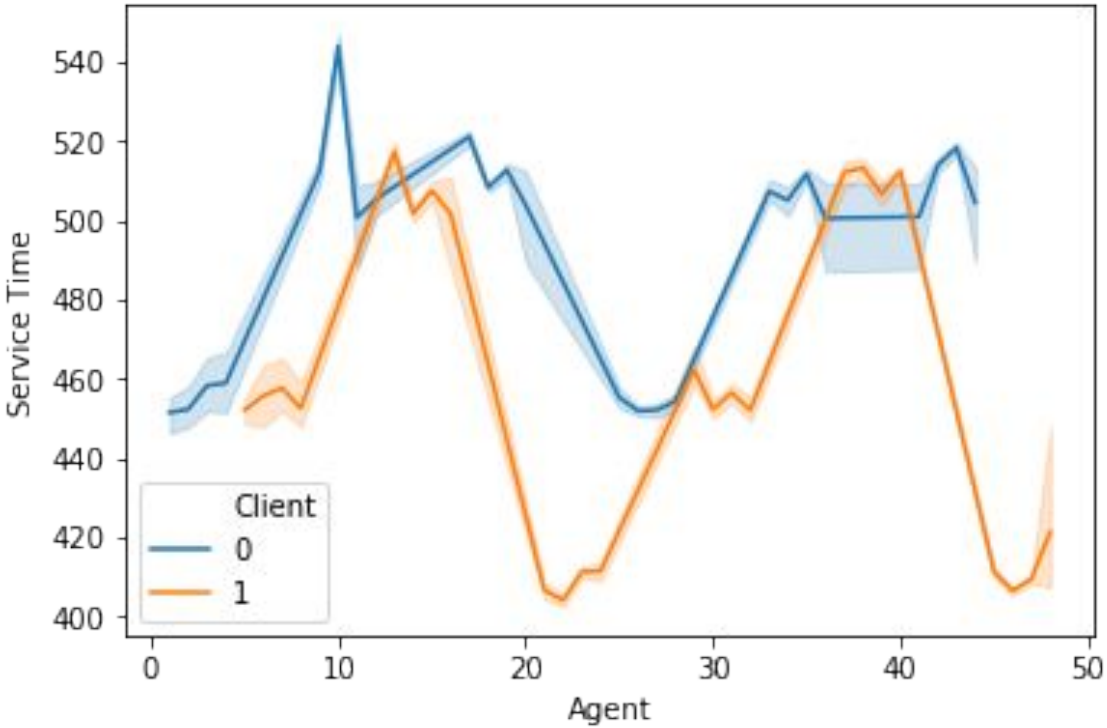


Insight

For all sites, Quality Scores improve as weeks progress.

Do we expect this trend with further week progressions?

Findings: Service Time vs Agent

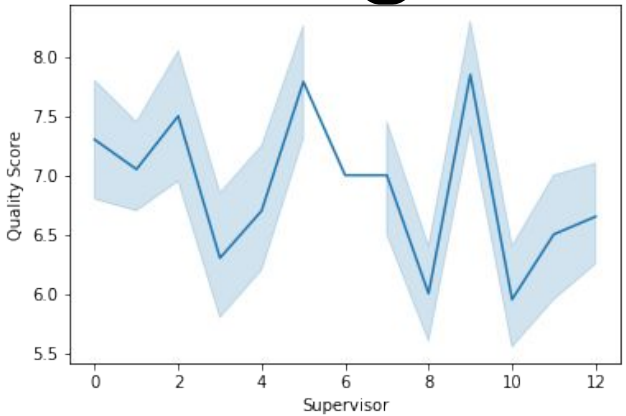


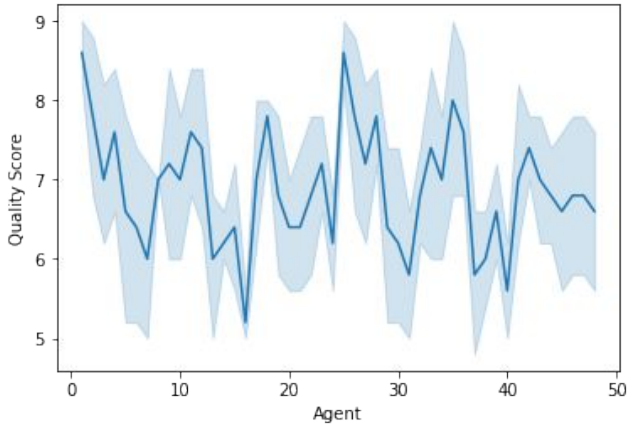
Insight

All agents with Client 0 have more Service Time

Are the services different based on the client?

Findings: Service Time vs Agent/Supervisor





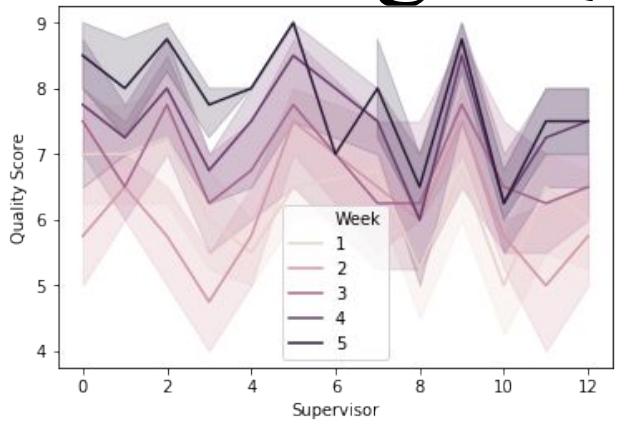
Insight

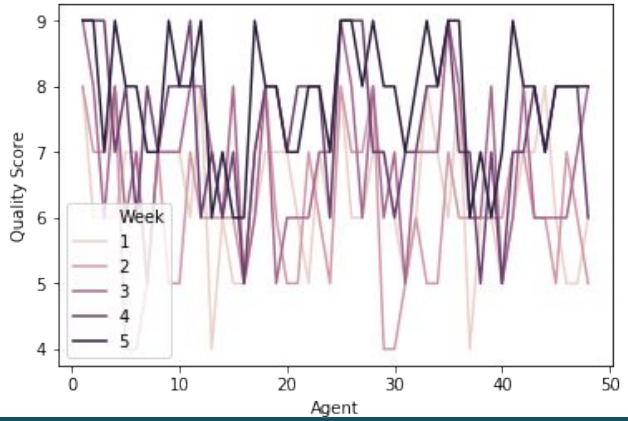
Supervisors: Consistency in Quality Score

Agents: High Variance in Quality Score

Are the agents relatively new?

Findings: Quality Score vs Agent/Supervisor





Insight

All Supervisors and Agents are improving with time.
(All their best scores (peaks) are in Week 5)

Is there a new business strategy (training) in implementation?

Results: ML model for Service Time

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Goal: Predict Service Time

- Input: Site, Client, Supervisor, Agent, Week, Quality Score
- Output: Service Time [350-476 or 476-700]
- Binary classification (Quality Score below 476 or above 476)
- Model: Random Forest (100 trees)
- Test model
  - 10-fold cross validation
  - 80-20% train-test split
- Verify model
  - Confusion Matrix
  - F1 Score
  - ROC curve

Results: ML model for Service Time

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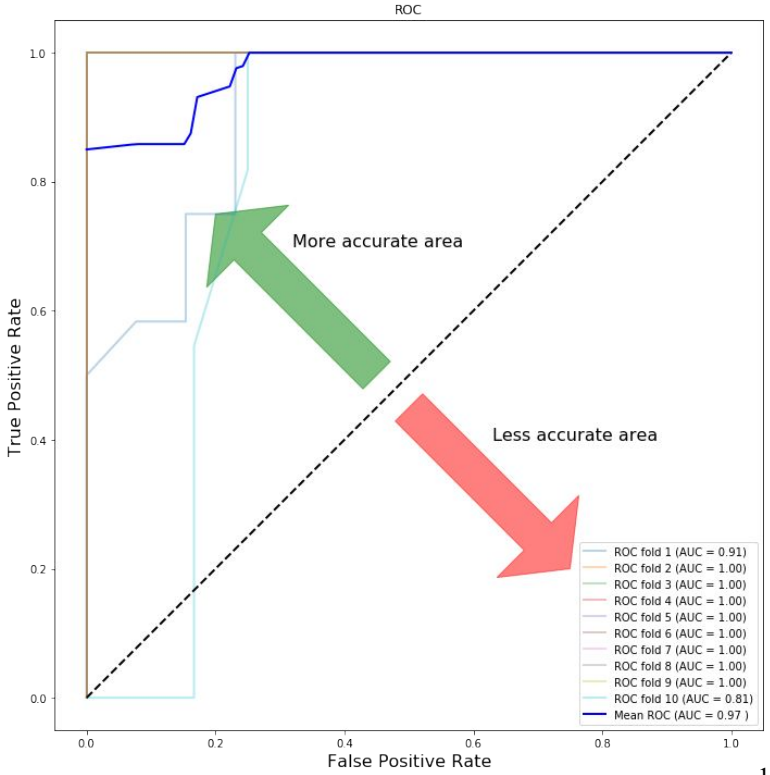
- Train-Test split:
  - Prediction Accuracy: 96.25 %
  - F-1 Score: 0.959
  - Confusion Matrix

28	2
0	**18**

- 10-fold cross validation:
  - Prediction Accuracy: 95.5 %
  - ROC curve (Shown on right)



ML model for Quality Score

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Goal: Predict Quality Score

- Input: Site, Client, Supervisor, Agent, Week, Service Time
- Output: Quality Score [0-7 or 7-10]
- Binary classification (Quality Score below 7 or above 7)
- Model: Random Forest (100 trees)
- Test model
  - 10-fold cross validation
  - 80-20% train-test split
- Verify model
  - Confusion Matrix
  - F1 Score
  - ROC curve

Results: ML model for Quality Score

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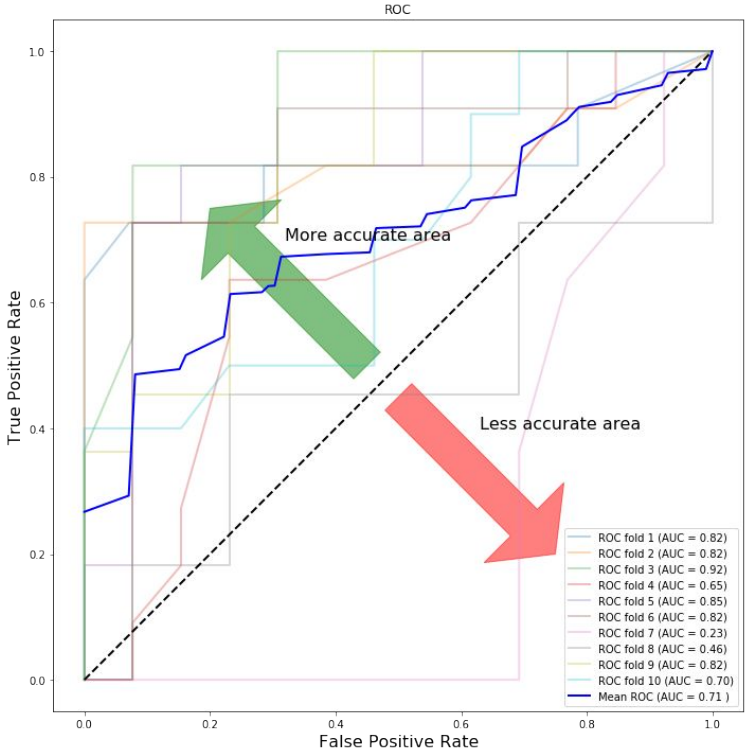
- Train-Test split:
  - Prediction Accuracy: 77.33 %
  - F-1 Score: 77.2 %
  - Confusion Matrix

$$\begin{pmatrix} 23 & 6 \\ 5 & 14 \end{pmatrix}$$

- 10-fold cross validation:
  - Prediction Accuracy: 62. 47 %
  - ROC curve (Shown on right)



Conclusion

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- Site 0: Increase in Service time -> Increase in Quality Score
- Quality Score varies with Client
  - Client 0: Score 5-9 **(Better)**
  - Client 1: Score 4-8
- For all sites, Quality Scores improve as weeks progress
- All agents with Client 0 have more Service Time
- Supervisors: Consistency in Quality Score
- Agents: High Variance in Quality Score
- All Supervisors and Agents are improving with time. (All their best scores (peaks) are in Week 5)
- **Predict Quality Score and Service Time**

Data split technique	Service Time	Quality Score
80-20% train-test split	96.25 %	77.33 %
10-fold cross validation	95.50 %	62.47 %

Future Work

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- Collect data for the upcoming week, new clients, new sites.
- Answer the following questions:
  - Are there different kinds of services for different sites?
  - Does type of service affect Quality Score?
  - Will Quality Score vary for each new client?
  - Do we expect this trend with further week progressions?
  - Are the services different based on the client?
  - Are the agents relatively new?
  - Is there a new business strategy (training) in implementation?

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THANK YOU