

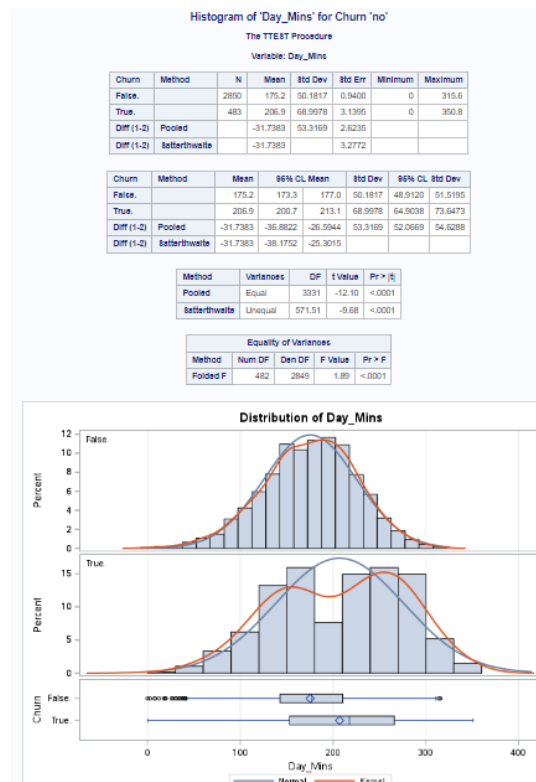
Conclusions and Recommendations

In this section, we focus on the insights and recommendations derived from the selected attributes model, which has demonstrated superior performance in predicting customer churn. The selected attributes model has yielded significantly improved results compared to the all-attributes model, showing better accuracy in predicting whether a customer will churn (class attribute). By analyzing key factors such as the number of calls to customer support service, charges for international calls, customer's state, and number of minutes the customer used the service during night time, we aim to provide actionable recommendations that leverage these insights to enhance retention strategies and reduce churn rates.

Major Findings:

Day_Mins and Churn

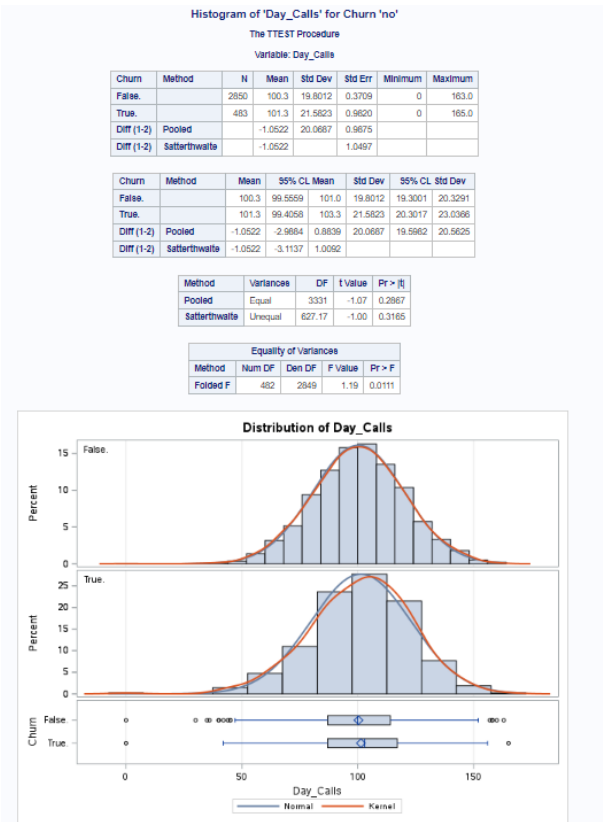
- **Significant Association:** The p-value (< 0.0001) indicates a strong association between the number of daytime minutes used and customer churn. Clients who churned tend to have significantly higher daytime minutes (206.9) compared to those who did not churn (175.2). This suggests that higher daytime usage may be linked to a higher likelihood of churn, highlighting Day_Mins as a potential predictor of customer churn.



Day_Calls and Churn

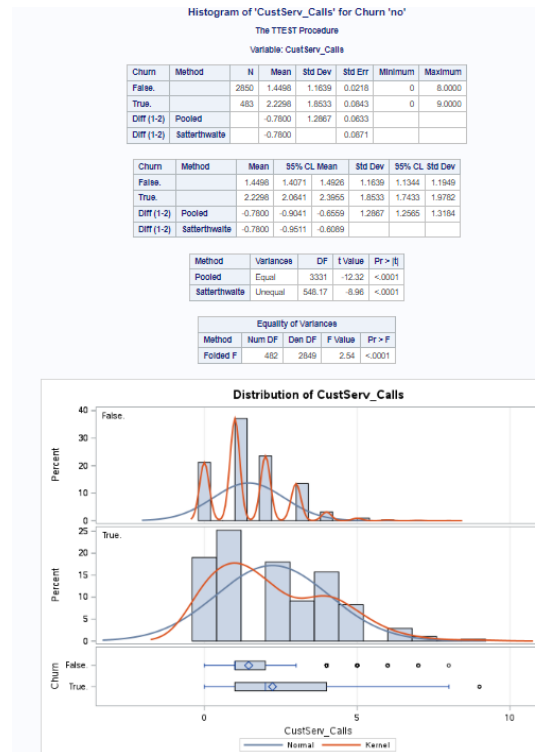
- **No Significant Association:** The p-values from the t-tests (0.2867 and 0.3165) indicate no statistically significant difference in the number of daytime calls between clients who churned

and those who did not. Although clients who churned had a slightly higher mean number of Day_Calls (101.3) compared to those who did not (100.3), this difference is not significant, suggesting that Day_Calls may not be an influential factor in predicting churn.



CustServ_Calls and Churn

- Significant Association: The p-value (< 0.0001) suggests a strong association between customer service calls and churn. Clients who churned made significantly more customer service calls (mean = 2.2298) than those who did not churn (mean = 1.4498). This highlights that frequent interactions with customer service are a strong indicator of potential churn.



Intl_Plan and Churn

- Moderate Association: The p-value (< 0.0001) and Cramer's V (0.2599) indicate a moderate association between having an international plan and customer churn. Clients with an international plan have a higher churn rate, with 137 out of 323 clients with the plan churning, compared to a lower churn rate for those without an international plan (346 out of 3010). This suggests that having an international plan is moderately associated with a higher likelihood of churn.

Contingency Table for Intl_Plan and Churn Status

The FREQ Procedure

| | | Table of Intl_Plan by Churn | | |
|-----------|---------------------------------|--------------------------------|----------------|-------|
| | | Churn | | Total |
| Intl_Plan | False. | True. | | |
| no | 2664 79.93 88.50 93.47 | 346 10.38 11.50 71.64 | 3010 90.31 | |
| yes | 186 5.58 57.59 6.53 | 137 4.11 42.41 28.36 | 323 9.69 | |
| Total | 2850 85.51 | 483 14.49 | 3333 100.00 | |

Statistics for Table of Intl_Plan by Churn

| Statistic | DF | Value | Prob |
|-----------------------------|----|----------|--------|
| Chi-Square | 1 | 225.0541 | <.0001 |
| Likelihood Ratio Chi-Square | 1 | 170.3998 | <.0001 |
| Continuity Adj. Chi-Square | 1 | 222.5658 | <.0001 |
| Mantel-Haenszel Chi-Square | 1 | 224.9895 | <.0001 |
| Phi Coefficient | | 0.2599 | |
| Contingency Coefficient | | 0.2515 | |
| Cramer's V | | 0.2599 | |

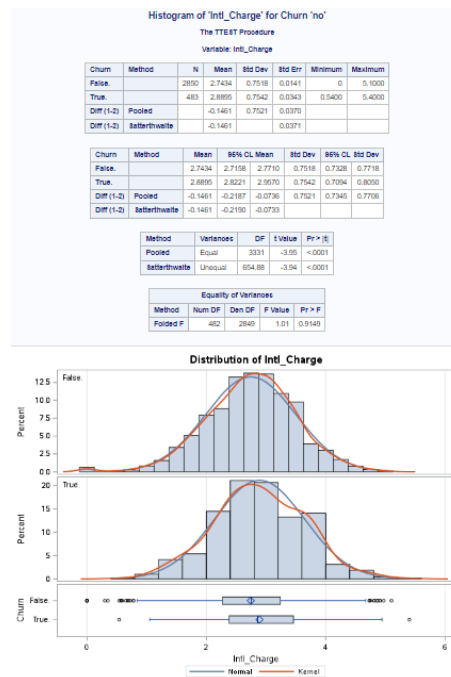
Fisher's Exact Test

| | |
|--------------------------|--------|
| Cell (1,1) Frequency (F) | 2664 |
| Left-sided Pr <= F | 1.0000 |
| Right-sided Pr >= F | <.0001 |
| Table Probability (P) | <.0001 |
| Two-sided Pr <= P | <.0001 |

Sample Size = 3333

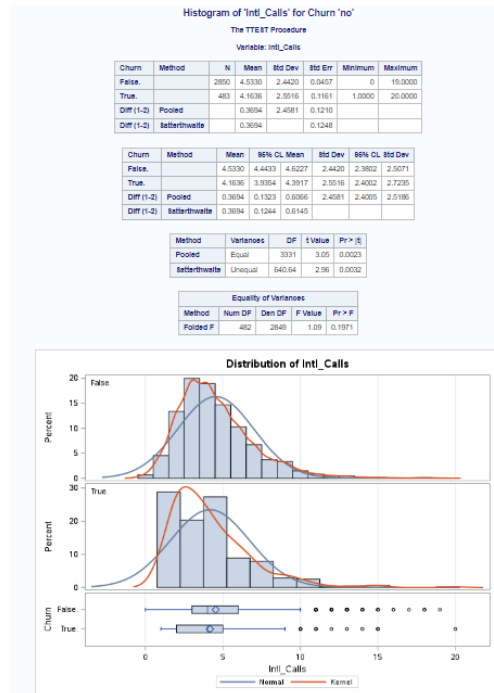
Intl_Charge and Churn

- Significant Association: The p-value (0.0001) indicates a significant difference in international charges between churned and non-churned clients. Clients who churned had slightly higher mean international charges (2.8895) compared to non-churned clients (2.7434), suggesting that higher international charges could be a contributing factor to churn.



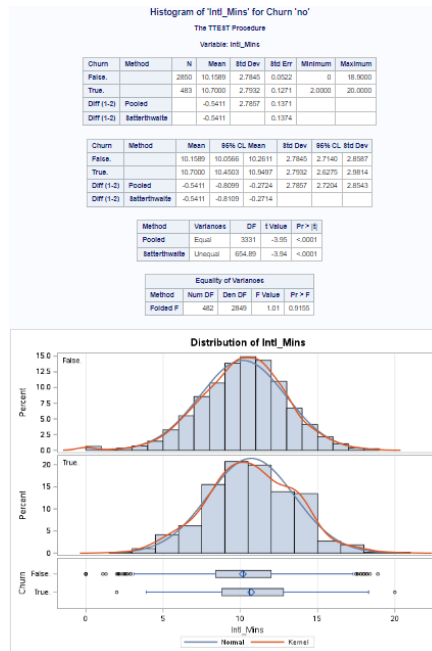
Intl_Calls and Churn

- Significant Association: The p-values (0.0023 and 0.0032) indicate a significant difference in the number of international calls between churned and non-churned clients. However, non-churned clients made slightly more international calls on average (0.3694 calls higher). While the difference is statistically significant, its small magnitude suggests that Intl_Calls might not be a strong standalone predictor of churn.



Intl_Mins and Churn

- Significant Association: The p-value (0.0001) indicates a significant difference in international minutes between churned and non-churned clients. Clients who churned had a slightly higher mean number of international minutes (10.70) compared to those who did not churn (10.16). While the difference is significant, it may be only one of several factors contributing to churn.



State and Churn

- Weak to Moderate Association: The p-value (0.0023) and Cramer's V (0.1578) indicate a moderate association between the client's state and churn status. States like New Jersey (26.47%) and California (26.47%) show higher churn rates, whereas states like Hawaii (5.66%) and Alaska (5.77%) have lower churn rates. While state is associated with churn, the strength of this relationship is limited.

Chi-Square Test for State and Churn Status

The FREQ Procedure

| Frequency Expected Percent Row Pct Col Pct | Table of State by Churn | | |
|--|-------------------------|-------|------|
| | State | False | True |

| State | False | True | Total |
|-------|--------|--------|-------|
| AK | 40 | 52 | 92 |
| AL | 72 | 80 | 152 |
| AR | 44 | 55 | 99 |
| AZ | 60 | 64 | 124 |
| CA | 29,073 | 4,9271 | 34 |
| CO | 57 | 66 | 123 |
| CT | 62 | 74 | 136 |
| DC | 49 | 54 | 103 |
| DE | 52 | 61 | 113 |
| FL | 55 | 63 | 118 |
| GA | 40 | 54 | 94 |
| HI | 50 | 53 | 103 |

| | | | |
|----|----|----|-----|
| IA | 41 | 3 | 44 |
| ID | 62 | 61 | 123 |
| IL | 53 | 58 | 111 |
| IN | 62 | 61 | 123 |
| KS | 57 | 70 | 127 |
| KY | 51 | 59 | 110 |
| LA | 47 | 4 | 51 |
| MA | 54 | 60 | 114 |
| MD | 53 | 70 | 123 |
| ME | 40 | 62 | 102 |
| MI | 57 | 73 | 130 |
| MN | 60 | 60 | 120 |
| MO | 56 | 7 | 63 |
| MT | 54 | 54 | 108 |
| NC | 56 | 62 | 118 |
| ND | 56 | 62 | 118 |
| NE | 56 | 62 | 118 |

| | | | |
|----|----|----|-----|
| NH | 47 | 9 | 56 |
| NJ | 60 | 68 | 128 |
| NM | 56 | 62 | 118 |
| NV | 56 | 62 | 118 |
| NY | 68 | 83 | 151 |
| OH | 56 | 78 | 134 |
| OK | 52 | 61 | 113 |
| OR | 56 | 62 | 118 |
| PA | 56 | 62 | 118 |
| RI | 56 | 62 | 118 |
| SC | 56 | 62 | 118 |
| SD | 56 | 62 | 118 |
| TN | 56 | 62 | 118 |
| TX | 56 | 62 | 118 |
| UT | 56 | 62 | 118 |
| VA | 56 | 62 | 118 |
| VT | 56 | 62 | 118 |
| WA | 56 | 62 | 118 |

Statistics for Table of State by Churn

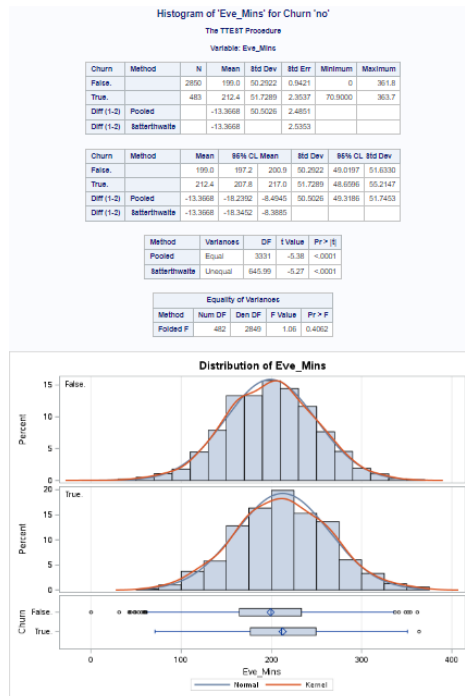
| Statistic | DF | Value | Prob |
|-----------------------------|----|---------|--------|
| Chi-Square | 50 | 83.0438 | 0.0023 |
| Likelihood Ratio Chi-Square | 50 | 83.1836 | 0.0022 |
| Mantel-Haenszel Chi-Square | 1 | 0.2017 | 0.6534 |
| Phi Coefficient | | 0.1578 | |
| Contingency Coefficient | | 0.1559 | |
| Cramer's V | | 0.1578 | |

Sample Size = 3333

| WV | 71 | 7 | 78 |
|--------|--------|--------|------|
| 66.697 | 11.303 | | |
| 2.13 | 0.21 | 2.34 | |
| 91.03 | 8.97 | | |
| 2.49 | 1.45 | | |
| 96 | 10 | 106 | |
| 90.639 | 15.361 | | |
| 2.88 | 0.30 | 3.18 | |
| 90.57 | 9.43 | | |
| 3.37 | 2.07 | | |
| 65.842 | 11.158 | | |
| 2.04 | 0.27 | 2.31 | |
| 86.31 | 11.69 | | |
| 2.39 | 1.86 | | |
| Total | 2850 | 483 | 3333 |
| 85.51 | 14.49 | 100.00 | |

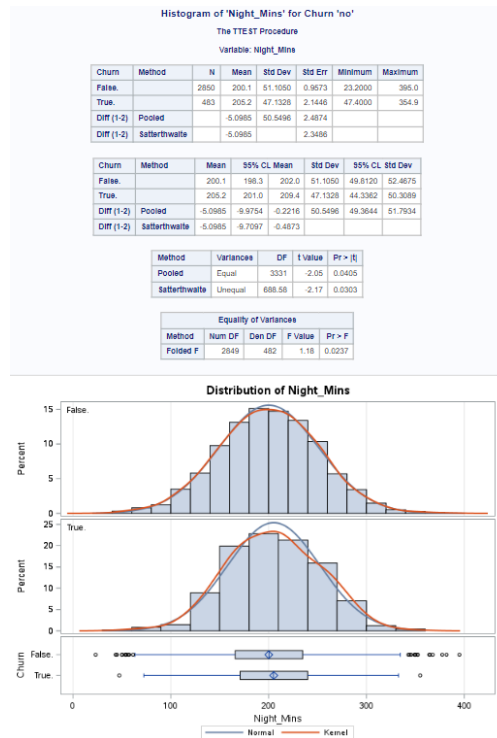
Eve_Mins and Churn

- Significant Association: The p-value (< 0.0001) indicates a significant difference in the number of evening minutes between churned and non-churned clients. Clients who churned had more evening minutes (212.4) compared to non-churned clients (199.0). This suggests that higher evening usage may be linked to a higher likelihood of churn, making Eve_Mins a potential predictor of churn.



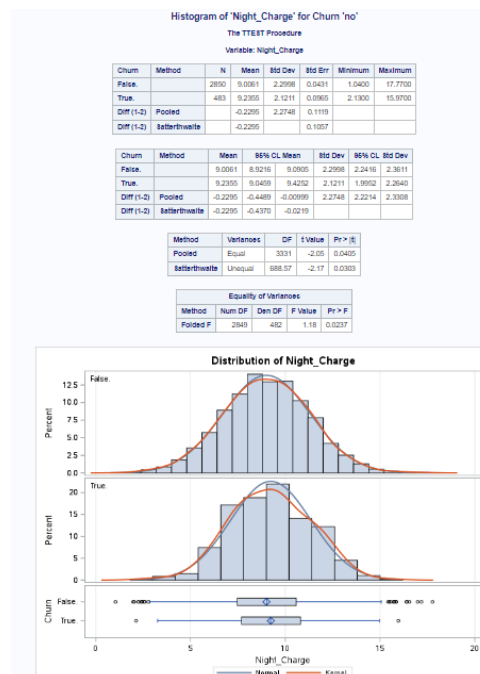
Night_Mins and Churn

- Significant Association: The p-values (0.0405 and 0.0303) indicate a significant difference in the number of night minutes between churned and non-churned clients. Churned clients had slightly more night minutes (205.2) than non-churned clients (200.1). Although the difference is statistically significant, the small magnitude may limit its practical importance as a predictor of churn.



Night_Charge and Churn

- Significant Association: The p-values (0.0405 and 0.0303) indicate a significant difference in night charges between churned and non-churned clients. Clients who churned had slightly higher night charges (9.24) compared to those who did not churn (9.01). While the difference is statistically significant, its small size suggests that Night_Charge may have limited practical significance as a predictor of churn.



Recommendations

1. Leverage **Day_Mins** Usage:

- Recommendation: Identify clients with high daytime usage (Day_Mins) as a priority for retention strategies. Since clients with higher daytime minutes are more likely to churn, targeting this group with special offers or loyalty rewards could help reduce churn. Consider offering personalized plans that cater to high daytime usage needs, ensuring these customers feel valued and satisfied with their service.

2. Deprioritize **Day_Calls** as a Churn Indicator:

- Recommendation: Given that the number of daytime calls (Day_Calls) does not significantly impact churn, it may not be worthwhile to focus retention efforts on this factor. Instead, direct resources towards attributes that show a stronger correlation with churn, such as Day_Mins or CustServ_Calls.

3. Focus on Customer Service Interactions (**CustServ_Calls**):

- Recommendation: Pay close attention to clients who frequently contact customer service (CustServ_Calls), as this group shows a strong likelihood of churning. Implement proactive retention strategies, such as offering personalized resolutions, enhanced support, and follow-up communications after each service interaction to address concerns and improve customer satisfaction.

4. Segment Clients with International Plans (**Intl_Plan**):

- Recommendation: Clients with international plans (Intl_Plan) are moderately more likely to churn. Segment this group for tailored retention efforts, such as offering exclusive international plan benefits, discounts, or add-ons to increase satisfaction and reduce the likelihood of churn. Additionally, ensure that the international plan meets their specific needs by regularly updating and communicating new plan options.

5. Monitor International Charges (**Intl_Charge**):

- Recommendation: Clients with higher international charges (Intl_Charge) are more likely to churn. Monitor international usage closely and consider offering targeted discounts, bundle offers, or loyalty perks for high international users to reduce their likelihood of leaving. Clear communication about international charge policies can also enhance transparency and customer trust.

6. Limit Focus on International Calls (**Intl_Calls**):

- Recommendation: While the difference in the number of international calls (Intl_Calls) between churned and non-churned clients is significant, its small magnitude suggests it may not be a strong standalone predictor. However, you can incorporate international call patterns into a broader churn prediction model, combining it with attributes such as Intl_Charge or Intl_Mins. This approach can provide a more comprehensive view of international activity and its impact on churn.

7. Track High International Minutes Usage (Intl_Mins):

- Recommendation: Clients with higher international minutes (Intl_Mins) are more likely to churn, though the effect may be modest. Consider offering specialized retention plans for high international minute users, such as discounted international minute packages or personalized offers to keep these clients engaged.

8. Tailor Strategies Based on State Demographics (State):

- Recommendation: Customize churn reduction strategies based on state demographics, especially in states with higher churn rates, like Mississippi and West Virginia. Consider region-specific marketing campaigns or support programs that address the unique needs and preferences of clients in these states. For states with lower churn rates, such as North Dakota and Nebraska, focus on maintaining customer satisfaction to prevent churn.

9. Target Clients with High Evening Minutes Usage (Eve_Mins):

- Recommendation: Clients with higher evening minutes (Eve_Mins) are more likely to churn, making them a key segment for retention efforts. Tailor retention campaigns to this group by offering special evening-time packages, loyalty rewards, or usage-based promotions to encourage them to stay with the service.

10. Limit Focus on Night Minutes (Night_Mins):

- Recommendation: Although the difference in night minutes (Night_Mins) usage between churned and non-churned clients is significant, the small magnitude limits its impact as a primary churn predictor. However, it should not be disregarded entirely. Night minutes usage can be included in retention strategies that focus on identifying and supporting high-usage clients across different time periods (e.g., day, evening, and night), ensuring they receive personalized offers or usage-based rewards.

11. Limit Focus on Night Charges (Night_Charge):

- Recommendation: While there is a significant difference in night charges (Night_Charge) between churned and non-churned clients, the small size of this difference suggests that it may not be a major factor in churn decisions. Instead, night charges can be used as a secondary metric in conjunction with more impactful predictors, such as Day_Mins or Eve_Mins. Retention efforts should prioritize these stronger attributes while keeping night charges in mind as a supplementary factor.

By implementing these recommendations, the company can enhance its retention strategies, better identify at-risk clients, and ultimately reduce churn rates, leading to improved customer loyalty and long-term revenue stability.