PREDICTION OF EMPLOYEE ATTRITION

STATISTICAL MODELLING FOR BUSINESS ANALYTICS

GROUP 1

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PROBLEM DEFINITION

Background

A focus on attrition drivers for top talent is particularly important for many organizations. In these cases, there is often more latitude for interventions; employees in these positions often have unique experience, are highly skilled, or are hard to replace for other reasons. Human Resources in organizations always try understanding what is most important to their employees, with the goal of making improvements to increase employee engagement, productivity, and reduce unwanted attrition.

Statement

To predict whether an employee will quit the organization if provided a similar opportunity at any other company.

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DATA COLLECTION

Dependent Variable (Binary)

- Attrition (Yes/No)

Independent Variables

OVERALL JOB SATISFACTION	EMPLOYEE ENGAGEMENT	OVERALL EXPERIENCE	JOB HECTICNESS	PERSONAL FACTORS
Job Satisfaction	Monthly Income	Num Companies Worked	Business Travel	Age
Environment Satisfaction	Stock Option Level	Years At Company	Distance From Home	Gender
Relationship Satisfaction	Years Since Last Promotion	Years In Current Role	Over Time	Marital Status
Work Life Balance	Training Times Last Year	Years With Curr Manager		

Descriptive Statistics

	Age	Business Travel	Distance From Home	Environment Satisfaction	Gender	Job Satisfaction	Marital Status	Monthly Income	Num Companies Worked
Count	615	615	615	615	615	615	615	615	615
Mean	36.9238	0.39252	9.19252	2.72177	0.6	2.72857	0.90272	6502.93	2.6932
Std. Dev.	9.13537	0.66546	8.10686	1.09308	0.49007	1.10285	0.73012	4707.96	2.49801
Minimum	18	0	1	1	0	1	0	1009	0
Maximum	60	1	29	4	1	4	2	19999	9
Median	36	0	7	3	1	3	1	4919	2

	Over Time	Relationship Satisfaction	Stock Option Level	Training Times Last Year	Work Life Balance	Years At Company	Years In Current Role	Years Since Last Promotion	Years With Curr Manager
Count	615	615	615	615	615	615	615	615	615
Mean	0.28299	2.71225	0.79388	2.79932	2.76122	7.00816	4.22925	2.18776	4.12313
Std. Dev.	0.45061	1.08121	0.85208	1.28927	0.70648	6.12653	3.62314	3.22243	3.56814
Minimum	0	1	0	0	1	0	0	0	0
Maximum	1	4	3	6	4	40	18	15	17
Median	0	3	1	3	3	5	3	1	3

CORRELATION MATRIX

	Age	Attrition	BusinessTravel	DistanceFromHome	EnvironmentSatisfaction	Gender	JobSatisfaction	MaritalStatus	MonthlyIncome	NumCompaniesWorked	OverTime	RelationshipSatisfaction	StockOptionLevel	TotalWorkingYears	TrainingTimesLastYear	WorkLifeBalance	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager
Age	1	-0.16	-0.025	-0.0017	0.01	-0.036	-0.0049	0.095	0.5	0.3	0.028	0.054	0.038	0.68	-0.02	-0.021	0.31	0.21	0.22	0.2
Attrition	-0.16	1	-7.4e-05	0.078	-0.1	0.029	-0.1	-0.16	-0.16	0.043	0.25	-0.046	-0.14	-0.17	-0.059	-0.064	-0.13	-0.16	-0.033	-0.16
BusinessTravel	-0.025	-7.4e-05	1	0.024	-0.0042	0.033	0.034	0.024	-0.034	-0.021	-0.017	0.036	0.017	-0.034	-0.015	0.011	0.015	0.011	0.033	0.023
DistanceFromHome	-0.0017	0.078	0.024	1	-0.016	-0.0019	-0.0037	0.014	-0.017	-0.029	0.026	0.0066	0.045	0.0046	-0.037	-0.027	0.0095	0.019	0.01	0.014
EnvironmentSatisfaction	0.01	-0.1	-0.0042	-0.016	1	0.00051	-0.0068	0.0036	-0.0063	0.013	0.07	0.0077	0.0034	-0.0027	-0.019	0.028	0.0015	0.018	0.016	-0.005
Gender	-0.036	0.029	0.033	-0.0019	0.00051	1	0.033	0.047	-0.032	-0.039	-0.042	0.023	0.013	-0.047	-0.039	-0.0028	-0.03	-0.041	-0.027	-0.031
JobSatisfaction	-0.0049	-0.1	0.034	-0.0037	-0.0068	0.033	1	-0.024	-0.0072	-0.056	0.025	-0.012	0.011	-0.02	-0.0058	-0.019	-0.0038	-0.0023	-0.018	-0.028
MaritalStatus	0.095	-0.16	0.024	0.014	0.0036	0.047	-0.024	1	0.075	0.036	0.018	-0.023	0.66	0.078	-0.011	-0.015	0.06	0.066	0.031	0.039
MonthlyIncome	0.5	-0.16	-0.034	-0.017	-0.0063	-0.032	-0.0072	0.075	1	0.15	0.0061	0.026	0.0054	0.77	-0.022	0.031	0.51	0.36	0.34	0.34
NumCompaniesWorked	0.3	0.043	-0.021	-0.029	0.013	-0.039	-0.056	0.036	0.15	1	-0.021	0.053	0.03	0.24	-0.066	-0.0084	-0.12	-0.091	-0.037	-0.11
OverTime	0.028	0.25	-0.017	0.026	0.07	-0.042	0.025	0.018	0.0061	-0.021	1	0.048	-0.00045	0.013	-0.079	-0.027	-0.012	-0.03	-0.012	-0.042
RelationshipSatisfaction	0.054	-0.046	0.036	0.0066	0.0077	0.023	-0.012	-0.023	0.026	0.053	0.048	1	-0.046	0.024	0.0025	0.02	0.019	-0.015	0.033	-0.00087
StockOptionLevel	0.038	-0.14	0.017	0.045	0.0034	0.013	0.011	0.66	0.0054	0.03	-0.00045	-0.046	1	0.01	0.011	0.0041	0.015	0.051	0.014	0.025
TotalWorkingYears	0.68	-0.17	-0.034	0.0046	-0.0027	-0.047	-0.02	0.078	0.77	0.24	0.013	0.024	0.01	1	-0.036	0.001	0.63	0.46	0.4	0.46
TrainingTimesLastYear	-0.02	-0.059	-0.015	-0.037	-0.019	-0.039	-0.0058	-0.011	-0.022	-0.066	-0.079	0.0025	0.011	-0.036	1	0.028	0.0036	-0.0057	-0.0021	-0.0041
WorkLifeBalance	-0.021	-0.064	0.011	-0.027	0.028	-0.0028	-0.019	-0.015	0.031	-0.0084	-0.027	0.02	0.0041	0.001	0.028	1	0.012	0.05	0.0089	0.0028
YearsAtCompany	0.31	-0.13	0.015	0.0095	0.0015	-0.03	-0.0038	0.06	0.51	-0.12	-0.012	0.019	0.015	0.63	0.0036	0.012	1	0.76	0.62	0.77
YearsInCurrentRole	0.21	-0.16	0.011	0.019	0.018	-0.041	-0.0023	0.066	0.36	-0.091	-0.03	-0.015	0.051	0.46	-0.0057	0.05	0.76	1	0.55	0.71
YearsSinceLastPromotion	0.22	-0.033	0.033	0.01	0.016	-0.027	-0.018	0.031	0.34	-0.037	-0.012	0.033	0.014	0.4	-0.0021	0.0089	0.62	0.55	1	0.51
YearsWithCurrManager	0.2	-0.16	0.023	0.014	-0.005	-0.031	-0.028	0.039	0.34	-0.11	-0.042	-0.00087	0.025	0.46	-0.0041	0.0028	0.77	0.71	0.51	1

Regressor	Logit (1)	Logit (2)	Logit (3)	Logit (4)	Probit (5)
Intercept	1.8636*** (0.425)	9.0656*** (1.439)	9.3825*** (1.672)	8.7878*** (1.839)	5.8398*** (1.114)
WorkLifeBalance	-0.1816· (0.099)	-0.1874· (0.103)	-0.1729 (0.108)	-0.2258· (0.119)	-0.1302 (0.073)
EnvironmentSatisfaction	-0.1703* (0.071)	-0.2388** (0.075)	-0.2619*** (0.079)	-0.3678*** (0.087)	-0.2327*** (0.052)
JobSatisfaction	-0.1915** (0.071)	-0.1759* (0.074)	-0.1768* (0.077)	-0.2229** (0.086)	-0.1471** (0.052)
RelationshipSatisfaction	-0.1490* (0.073)	-0.1643* (0.076)	-0.2042* (0.081)	-0.2259* (0.089)	-0.0901· (0.053)
Log(MonthlyIncome)		-0.7429*** (0.153)	-0.7727*** (0.194)	-0.8688*** (0.213)	-0.4214** (0.129)
Stock Option Level		-0.5372*** (0.103)	-0.5854*** (0.108)	-0.5961*** (0.119)	-0.1252 (0.086)
YearsSinceLastPromotion		-0.0068 (0.031)	0.1340** (0.041)	-0.1288** (0.045)	0.0739** (0.026)
TrainingTimesLastYear		-0.1333· (0.069)	-0.1164 (0.073)	-0.1004 (0.080)	-0.0645 (0.048)
NumCompaniesWorked			0.0970* (0.038)	0.1390*** (0.042)	0.1096*** (0.026)
YearsWithCurrManager			-0.1787*** (0.046)	-0.1968*** (0.052)	-0.1276*** (0.030)
YearsInCurrentRole			-0.0154 (0.043)	-0.0231 (0.048)	-0.0287 (0.028)
YearsAtCompany			-0.0286 (0.033)	0.0065 (0.036)	0.0307 (0.021)
BusinessTravel				1.1820*** (0.192)	0.6785*** (0.114)
log(DistanceFromHome)				0.6367*** (0.093)	0.3519*** (0.055)
Over Time				-1.0719*** (0.213)	-0.7284*** (0.128)
Age					-0.0424*** (0.008)
Gender					-0.0762 (0.119)
Marital Status					-0.3653*** (0.100)
AIC	910.53	856.77	811	705	670
Pseudo R^2	0.014	0.072	0.121	0.240	0.274

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FINAL MODEL

$$5.840 - 0.130\,WorkLifeBalance - 0.233\,EnvironmentSatisfaction$$
$$- 0.147\,JobSatisfaction - 0.090\,RelationShipSatisfaction$$
$$- 0.421\,\log(MonthlyIncome) - 0.125\,StockOptionLevel$$
$$+ 0.074\,YearsSinceLastPromotion - 0.064\,TrainingTimesLastYears$$
$$+ 0.110\,NumCompaniesWorked - 0.128\,YearsWithCurrManager$$
$$- 0.029\,YearsInCurrentRole + 0.031\,YearsAtCompany + 0.678\,BusinessTravel$$
$$+ 0.35\,\log(DistanceFromHome) - 0.728\,OverTime - 0.042\,Age$$
$$- 0.076\,Gender - 0.365\,MaritalStatus$$

CONFUSION MATRIX		Predicted	
		0	1
Actual	0	314	213
	1	21	157

- Accuracy = 417/615 * 100 = 76.5%

- Recall = 157 / 178 * 100 = 88.2%

- Precision = 157 / 280 * 100 = 56.07%

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INFERENCES & CONCLUSIONS

- Attrition is highly influenced by Overtime the employee work, the amount of business travel required for the job and the monthly income of the employee.

- Attrition is moderately influenced by the distance from home to job location and the marital status.

- Work life balance and Job Satisfaction were intuitively expected to have a bigger impact in the attrition, but the actual contribution was low.

- Gender, Age, Years in the current role had no significant impact in the determination of attrition rate.

- Omitted Variable Bias can include higher studies, monotonicity / job not interesting, leaving job for ethical issues, health problems, spouse job transfer, leaving to start own business, sample selection.

THANK YOU.!!