

**Table 2** The accuracy of predicting the severity of *Eclipse*.

Product- Component	ILS	NB	SVM	KNN	RT	J48	MAX_ACC	AVG_ACC
JDT_ Debug	Original	70.78	70.78	<b>71.08</b>	68.37	70.78	71.08	70.25
	RUS	<b>67.77</b>	32.53	66.87	60.24	54.52	67.77	62.35
	ROS	67.77	<b>71.19</b>	71.08	70.48	68.67	71.19	69.50
	SMOTE	<b>71.39</b>	70.78	65.06	63.25	<b>71.39</b>	71.39	67.77
	CMA	70.78	70.78	71.08	67.47	<b>71.39</b>	71.39	70.18
	FER	<b>73.49</b>	70.78	72.03	69.28	71.48	<b>73.49</b>	<b>71.57</b>
CDT_ Core	Original	68.06	80.1	<b>80.63</b>	73.82	80.1	80.63	75.65
	RUS	55.5	<b>79.06</b>	72.77	62.3	52.88	79.06	60.86
	ROS	66.49	80.1	<b>80.63</b>	76.96	73.82	80.63	74.48
	SMOTE	79.58	<b>80.1</b>	73.82	68.59	75.92	80.1	74.48
	CMA	70.16	80.1	<b>80.63</b>	76.44	80.1	80.63	76.83
	FER	<b>81.67</b>	80.1	80.74	75.39	80.63	<b>81.67</b>	<b>79.61</b>
Platform_ Debug	Original	62.97	<b>63.09</b>	52.36	58.96	58.96	63.09	58.31
	RUS	64.62	<b>66.98</b>	51.89	54.72	53.77	66.98	56.25
	ROS	66.51	45.28	52.36	<b>67.45</b>	61.79	67.45	62.03
	SMOTE	<b>69.81</b>	36.32	52.36	68.4	58.02	69.81	62.15
	CMA	<b>66.98</b>	63.67	52.36	58.49	63.68	66.98	60.38
	FER	<b>72.04</b>	36.02	60.24	60.66	62.56	<b>72.04</b>	<b>63.88</b>
Platform_ UI	Original	60.43	71.77	69.6	65.78	<b>73.57</b>	73.57	67.35
	RUS	61.3	64.91	58.7	62.02	<b>67.73</b>	67.73	62.44
	ROS	60.72	38.12	69.6	67.29	<b>70.11</b>	70.11	66.93
	SMOTE	59.13	28.23	63.97	67.08	<b>73.94</b>	73.94	66.03
	CMA	61.88	71.77	69.82	70.76	<b>72.06</b>	72.06	68.63
	FER	66.47	27.71	71.28	70.98	<b>74.96</b>	<b>74.96</b>	<b>70.92</b>
Eclipse_ALL	AVG	67.35	61.68	67.12	66.88	68.45	72.82	67.45

**Table 4** The accuracy of predicting the severity of *GNOME*.

Product- Component	ILS	NB	SVM	KNN	RT	J48	MAX_ACC	AVG_ACC
Terminal_ General	Original	86.7	92.69	93.1	92.6	<b>93.6</b>	93.6	91.50
	RUS	83.54	89.36	<b>92.93</b>	89.11	92.02	92.93	89.40
	ROS	92.02	92.6	93.1	93.02	<b>93.1</b>	93.1	92.81
	SMOTE	92.69	7.32	87.61	92.19	<b>93.85</b>	93.85	91.59
	CMA	86.37	7.32	<b>93.1</b>	91.85	92.69	93.1	91.00
	FER	92.93	7.32	<b>94.18</b>	92.77	93.85	<b>94.18</b>	<b>93.43</b>
Ekiga_ General	Original	<b>91.21</b>	90.48	90.66	91.03	91.01	91.21	90.98
	RUS	91.76	90.48	<b>92.24</b>	91.21	90.48	92.24	91.42
	ROS	<b>91.39</b>	90.66	90.66	89.56	91.03	91.39	90.66
	SMOTE	91.58	9.52	<b>93.77</b>	92.86	91.94	93.77	<b>92.54</b>
	CMA	90.84	9.52	90.66	<b>92.49</b>	<b>90.48</b>	92.49	91.12
	FER	91.58	9.52	<b>94.32</b>	91.94	91.76	<b>94.32</b>	92.40
Evolution_ Calendar	Original	79.3	82.2	81.78	<b>82.28</b>	81.73	82.28	81.27
	RUS	77.09	<b>84.24</b>	79.56	70.36	72.83	84.24	74.96
	ROS	79.13	<b>85.01</b>	81.18	81.94	76.75	85.01	79.75
	SMOTE	<b>81.77</b>	17.8	79.05	79.9	81.18	81.77	80.48
	CMA	79.22	17.8	<b>82.2</b>	81.94	<b>82.2</b>	82.2	81.39
	FER	81.74	17.8	82.2	82.46	<b>85.4</b>	<b>85.4</b>	<b>82.95</b>
Evolution_ Contacts	Original	73.86	73.49	73.49	72.26	<b>74.97</b>	74.97	73.65
	RUS	71.52	67.82	<b>73.61</b>	68.43	66.72	73.61	70.07
	ROS	72.63	69.05	73.12	71.76	<b>74.48</b>	74.48	73.00
	SMOTE	73.37	26.51	<b>77.07</b>	72.5	71.52	77.07	73.62
	CMA	73.37	26.51	73.49	71.52	<b>73.74</b>	73.74	73.03
	FER	74.63	26.51	<b>78.46</b>	77.1	75.34	<b>78.46</b>	<b>76.38</b>
GNOME_ALL	AVG	83.34	49.65	85.06	83.88	84.28	86.23	84.14

**Table 5** The F-measure of predicting the severity of *Eclipse*.

Product- Component	ILS	NB	SVM	KNN	RT	J48	MAX_ <i>F</i>	AVG_ <i>F</i>
JDT_ Debug	Original	<b>0.71</b>	0.59	0.69	0.62	0.65	0.71	0.67
	RUS	<b>0.69</b>	0.2	0.67	0.62	0.56	0.69	0.64
	ROS	0.69	<b>0.71</b>	0.69	0.7	0.66	0.71	0.69
	SMOTE	<b>0.7</b>	0.59	0.67	0.64	0.68	0.7	0.67
	CMA	<b>0.71</b>	0.59	0.69	0.67	0.63	0.71	0.66
	FER	<b>0.74</b>	0.59	0.71	0.67	0.68	<b>0.74</b>	<b>0.70</b>
CDT_ Core	Original	0.7	0.71	<b>0.74</b>	<b>0.74</b>	0.71	0.74	0.72
	RUS	0.6	<b>0.72</b>	0.7	0.64	0.57	0.72	0.63
	ROS	0.7	0.71	0.74	<b>0.75</b>	0.73	0.75	0.73
	SMOTE	<b>0.78</b>	0.71	0.74	0.71	0.74	0.78	0.74
	CMA	0.72	0.71	0.74	<b>0.75</b>	0.71	0.75	0.73
	FER	<b>0.8</b>	0.71	0.76	0.75	0.78	<b>0.8</b>	<b>0.77</b>
Platform_ Debug	Original	0.68	<b>0.7</b>	0.53	0.59	0.59	0.7	0.60
	RUS	0.65	<b>0.68</b>	0.52	0.55	0.54	0.68	0.57
	ROS	<b>0.67</b>	0.36	0.53	<b>0.67</b>	0.61	0.67	0.62
	SMOTE	<b>0.68</b>	0.19	0.51	<b>0.68</b>	0.59	0.68	0.62
	CMA	<b>0.67</b>	0.19	0.53	0.57	0.58	0.67	0.56
	FER	<b>0.71</b>	0.19	0.61	0.61	0.63	<b>0.71</b>	<b>0.64</b>
Platform_ UI	Original	0.62	0.6	<b>0.69</b>	0.66	0.7	0.69	0.67
	RUS	0.63	0.67	0.61	0.63	<b>0.68</b>	0.68	0.64
	ROS	0.63	0.31	0.69	0.66	<b>0.7</b>	0.7	0.67
	SMOTE	0.61	0.12	0.66	0.68	<b>0.72</b>	<b>0.72</b>	0.67
	CMA	0.64	0.6	<b>0.69</b>	0.68	0.61	0.69	0.66
	FER	0.68	0.12	0.69	<b>0.72</b>	<b>0.72</b>	<b>0.72</b>	<b>0.70</b>
Eclipse_ALL	AVG	0.68	0.51	0.66	0.67	0.66	0.71	0.66

**Table 7** The F-measure of predicting the severity of *GNOME*.

Product- Component	ILS	NB	SVM	KNN	RT	J48	MAX_ <i>F</i>	AVG_ <i>F</i>
Terminal_ General	Original	0.89	0.89	0.91	<b>0.92</b>	<b>0.92</b>	0.92	0.91
	RUS	0.87	0.91	0.92	0.91	<b>0.93</b>	0.93	0.91
	ROS	<b>0.93</b>	0.9	0.91	<b>0.93</b>	0.92	0.93	<b>0.92</b>
	SMOTE	0.91	0.01	0.89	<b>0.93</b>	0.91	0.93	0.91
	CMA	0.88	0.01	<b>0.91</b>	0.9	<b>0.91</b>	0.91	0.90
	FER	0.87	0.01	<b>0.94</b>	0.92	0.92	<b>0.94</b>	0.91
Ekiga_ General	Original	<b>0.91</b>	0.86	0.87	0.9	0.88	0.91	0.89
	RUS	0.93	0.86	<b>0.94</b>	0.92	0.92	0.94	<b>0.93</b>
	ROS	<b>0.92</b>	0.86	0.87	0.88	<b>0.92</b>	0.92	0.90
	SMOTE	0.9	0.02	<b>0.93</b>	<b>0.93</b>	<b>0.93</b>	0.93	0.92
	CMA	<b>0.91</b>	0.02	0.87	<b>0.91</b>	0.86	0.91	0.89
	FER	0.88	0.02	<b>0.95</b>	0.92	0.89	<b>0.95</b>	0.91
Evolution_ Calendar	Original	0.81	0.74	0.79	<b>0.82</b>	0.81	0.82	0.81
	RUS	0.79	<b>0.82</b>	0.79	0.74	0.76	0.82	0.77
	ROS	0.81	<b>0.83</b>	0.79	0.81	0.79	0.83	0.80
	SMOTE	0.81	0.05	0.8	0.81	<b>0.82</b>	0.82	0.81
	CMA	<b>0.81</b>	0.05	0.79	0.79	0.74	0.81	0.78
	FER	0.81	0.05	0.84	0.82	<b>0.85</b>	<b>0.85</b>	<b>0.83</b>
Evolution_ Contacts	Original	0.74	0.62	0.69	0.71	<b>0.76</b>	0.76	0.73
	RUS	0.72	0.7	<b>0.73</b>	0.7	0.68	0.73	0.71
	ROS	0.73	0.71	0.68	0.7	<b>0.76</b>	0.76	0.72
	SMOTE	0.71	0.11	<b>0.77</b>	0.72	0.72	0.77	0.73
	CMA	<b>0.74</b>	0.11	0.69	0.7	0.63	0.74	0.69
	FER	0.8	0.11	<b>0.82</b>	0.71	0.8	<b>0.82</b>	<b>0.78</b>
GNOME_ALL	AVG	0.84	0.43	0.84	0.83	0.83	0.86	0.84

**Table 8** The AUC of predicting the severity of *Eclipse*.

Product- Component	ILS	NB	SVM	KNN	RT	J48	MAX_AUC	AVG_AUC
JDT_ Debug	Original	<b>0.67</b>	0.5	0.59	0.61	0.59	0.67	0.62
	RUS	<b>0.68</b>	0.52	0.61	0.63	0.65	0.68	0.64
	ROS	<b>0.66</b>	0.62	0.59	0.62	0.63	0.66	0.63
	SMOTE	<b>0.66</b>	0.5	0.65	0.58	0.58	0.66	0.62
	CMA	<b>0.67</b>	0.5	0.59	0.62	0.52	0.67	0.60
	FER	<b>0.74</b>	0.5	0.73	0.67	0.6	<b>0.74</b>	<b>0.69</b>
CDT_ Core	Original	<b>0.65</b>	0.5	0.54	0.58	0.5	0.65	0.57
	RUS	0.56	0.5	0.55	0.48	<b>0.64</b>	0.64	0.56
	ROS	<b>0.65</b>	0.5	0.54	0.57	0.58	0.65	0.59
	SMOTE	<b>0.65</b>	0.5	0.61	<b>0.65</b>	0.61	0.65	0.63
	CMA	<b>0.65</b>	0.5	0.54	<b>0.59</b>	0.5	0.65	0.57
	FER	0.67	0.5	<b>0.71</b>	0.6	0.65	<b>0.71</b>	<b>0.66</b>
Platform_ Debug	Original	<b>0.68</b>	0.5	0.52	0.55	0.62	0.68	0.59
	RUS	0.66	<b>0.68</b>	0.55	0.59	0.59	0.68	0.60
	ROS	<b>0.67</b>	0.57	0.55	0.63	0.64	0.67	0.62
	SMOTE	<b>0.7</b>	0.5	0.6	0.64	0.6	0.7	0.64
	CMA	<b>0.68</b>	0.5	0.52	0.53	0.56	0.68	0.57
	FER	<b>0.73</b>	0.5	0.61	0.6	0.63	<b>0.73</b>	<b>0.64</b>
Platform_ UI	Original	<b>0.69</b>	0.5	0.6	0.59	0.65	0.69	0.63
	RUS	0.68	<b>0.69</b>	0.61	0.58	0.66	0.69	0.63
	ROS	<b>0.7</b>	0.57	0.6	0.57	0.63	0.7	0.63
	SMOTE	0.67	0.5	0.68	0.62	<b>0.7</b>	0.7	0.67
	CMA	<b>0.7</b>	0.5	0.6	0.58	0.52	0.7	0.60
	FER	0.69	0.5	0.67	0.67	<b>0.79</b>	<b>0.79</b>	<b>0.71</b>
Eclipse_ALL	AVG	0.67	0.53	0.60	0.60	0.61	0.69	0.62

**Table 10** The AUC of predicting the severity of *GNOME*.

Product- Component	ILS	NB	SVM	KNN	RT	J48	MAX_AUC	AVG_AUC
Terminal_ General	Original	0.89	0.5	0.65	0.62	<b>0.95</b>	0.95	0.78
	RUS	0.88	0.78	0.75	0.84	<b>0.95</b>	0.95	0.86
	ROS	<b>0.95</b>	0.53	0.65	0.69	0.65	0.95	0.74
	SMOTE	0.81	0.5	0.73	0.8	<b>0.85</b>	0.85	0.80
	CMA	<b>0.89</b>	0.5	0.65	0.73	0.81	0.89	0.77
	FER	0.9	0.5	0.94	0.93	<b>0.96</b>	<b>0.96</b>	<b>0.93</b>
Ekiga_ General	Original	<b>0.93</b>	0.5	0.49	0.65	0.92	0.93	0.75
	RUS	<b>0.94</b>	0.51	0.88	0.93	0.91	0.94	0.92
	ROS	<b>0.93</b>	0.51	0.49	0.57	0.92	0.93	0.73
	SMOTE	<b>0.95</b>	0.5	0.72	0.77	<b>0.95</b>	<b>0.95</b>	0.85
	CMA	<b>0.93</b>	0.5	0.49	0.67	0.5	0.93	0.65
	FER	0.93	0.5	0.93	0.91	<b>0.95</b>	<b>0.95</b>	<b>0.93</b>
Evolution_ Calendar	Original	0.82	0.5	0.66	0.67	<b>0.85</b>	<b>0.85</b>	0.75
	RUS	0.81	0.64	0.68	0.69	<b>0.83</b>	0.83	0.75
	ROS	<b>0.82</b>	0.66	0.66	0.66	0.7	0.82	0.71
	SMOTE	0.79	0.5	0.76	0.7	<b>0.84</b>	0.84	0.77
	CMA	<b>0.82</b>	0.5	0.66	0.66	0.5	0.82	0.66
	FER	0.82	0.5	<b>0.85</b>	0.81	<b>0.85</b>	<b>0.85</b>	<b>0.83</b>
Evolution_ Contacts	Original	0.76	0.5	0.62	0.63	<b>0.8</b>	<b>0.8</b>	0.70
	RUS	0.75	<b>0.76</b>	0.66	0.66	<b>0.76</b>	0.76	0.71
	ROS	<b>0.76</b>	<b>0.76</b>	0.62	0.6	0.74	0.76	0.68
	SMOTE	0.72	0.5	0.74	0.63	<b>0.76</b>	0.76	0.71
	CMA	<b>0.76</b>	0.5	0.62	0.64	0.52	0.76	0.64
	FER	0.78	0.5	<b>0.8</b>	0.73	<b>0.8</b>	<b>0.8</b>	<b>0.78</b>
GNOME_ALL	AVG	0.85	0.55	0.70	0.72	0.80	0.87	0.77