

## Supplementary Material

### **Forest fire and its key drivers in the tropical forests of northern Vietnam**

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## Supplementary materials

**Supplementary Table 1.** Estimates of model performance (AUC) on training and test data that were used to select the regularization multiplier for each model to limit model complexity and overfitting to the training data. The selected regularization multiplier for the model for each province is highlighted. This is the multiplier that minimized the difference in AUC between evaluations on the training and the test data without unduly increasing the generality of the model, and thus yielding notably lower AUC than alternatives.

Province	Regularization	AUC training	AUC test	Difference
Dien Bien	1	0.6809	0.6803	0.0006
Dien Bien	2	0.6744	0.6756	-0.0012
Dien Bien	3	0.6677	0.6650	0.0027
Dien Bien	4	0.6588	0.6558	0.0030
Dien Bien	5	0.6513	0.6467	0.0046
Lao Cai	1	0.8262	0.7867	0.0395
Lao Cai	2	0.8143	0.7837	0.0305
Lao Cai	3	0.8048	0.7759	0.0289
Lao Cai	4	0.7981	0.7871	0.0110
Lao Cai	5	0.7974	0.7767	0.0207
Son La	1	0.7555	0.7547	0.0008
Son La	2	0.7512	0.7517	-0.0005
Son La	3	0.7466	0.7479	-0.0013
Son La	4	0.7433	0.7415	0.0018
Son La	5	0.7417	0.7404	0.0013
Combined	1	0.7196	0.7171	0.0025
Combined	2	0.7123	0.7115	0.0009
Combined	3	0.7049	0.7031	0.0018
Combined	4	0.6982	0.6961	0.0021
Combined	5	0.6935	0.6943	-0.0008

**Supplementary Table 2.** The relationship between forest fire and weather condition, topography, fuel condition, and human activities in Dien Bien, Lao Cai, Son La, and combined provinces using univariate logistic regression models.

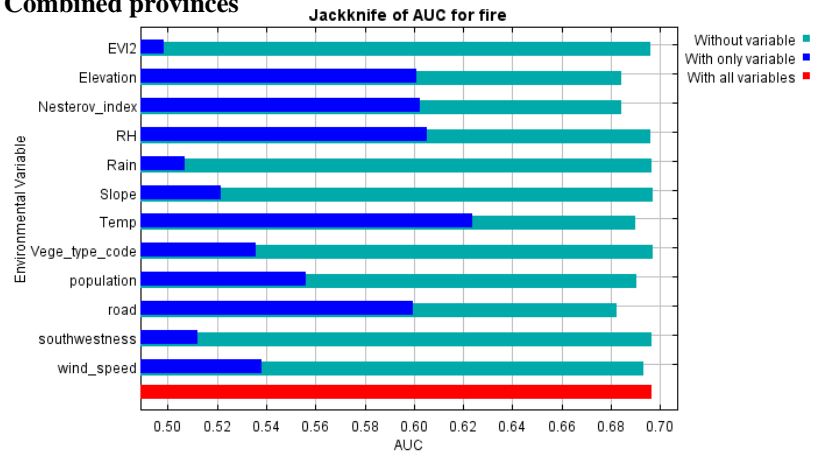
Variables	Dien Bien		Lao Cai		Son La		Combined provinces	
	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value
<b>Weather condition</b>								
Temperature	0.1	<2e-16***	0.03	0.004**	0.08	<2e-16***	0.11	<2e-16***
Rain	-0.007	0.14	-0.03	0.1	-0.03	1.2e-06***	-0.01	0.0002***
Relative humidity	-0.03	<2e-16***	-0.02	1.4e-10***	-0.02	<2e-16***	-0.03	<2e-16***
Wind speed	0.008	0.16	0.07	4.4e-11***	0.003	0.3	-0.01	8.9e-06***
Modified Nesterov index	4.2e-05	<2e-16***	2.6e-05	0.07	6.4e-05	<2e-16***	6.8e-05	<2e-16***
<b>Topography</b>								
Elevation	7.4e-04	<2e-16***	0.001	<2e-16***	5.2e-04	<2e-16***	6.1e-04	<2e-16***
Slope	0.007	0.02*	0.03	6.4e-06***	0.02	2.2e-13***	0.01	1.6e-11***
Southwestness index	0.02	0.64	-0.2	0.03*	0.2	1.08e-06***	0.09	4.7e-05***
<b>Fuel condition</b>								
EVI2	-1.7e-04	3.3e-06***	1.5e-04	0.07	2e-04	5e-10***	2.1e-05	0.33
Vegetation type								
<i>Mixed forest</i>	2.9	0.004**	0.4	0.6	0.9	2.2e-07***	1.02	3.15e-11***
<i>Natural forest</i>	4.3	1.5e-05***	1.5	0.04*	0.06	0.7	0.94	1.1e-10***
<i>Plantation forest</i>	2.2	0.03*	0.2	0.8	-1.5	4.2e-12***	-0.9	3.76e-07***
<b>Human activity</b>								
Population density	-0.02	<2e-16***	-0.004	0.01*	-0.0008	0.07	-0.007	<2e-16***
Distance to nearest road	-8.50e-05	4.8e-16***	-3.3e-05	0.13	2.3e-04	<2e-16***	1.05e-04	<2e-16***

\*, \*\*, and \*\*\* indicate  $P < 0.05$ ,  $P < 0.01$ , and  $P < 0.001$ , respectively; codes for variables are as given in table 1

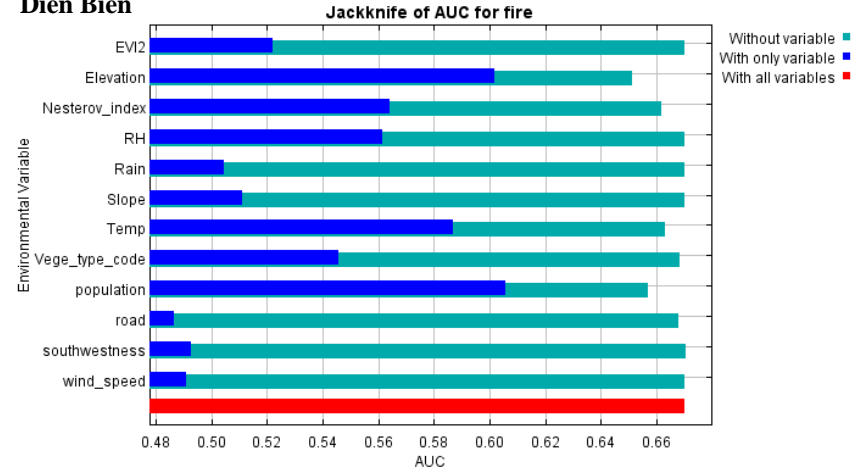
**Supplementary Table 3.** The average weather conditions (temperature, rainfall, relative humidity, wind speed, MNI) and number of fires on selected days with high MNI (>2,500), moderate MNI (from 1,000 to 2,500), and low MNI (less than 1,000) in Dien Bien, Lao Cai, and Son La provinces.

Level of MNI	Variable	Dien Bien	Lao Cai	Son La
High (25/02/2007)	Temperature	26.4	25.8	27.3
	Rainfall	0	0	0
	Relative humidity	50	61	52
	Wind speed	4.8	7.2	8.1
	Modified Nesterov index	30,783	8,796	28,393
	Number of fires	6	2	9
Moderate (19/01/2012)	Temperature	22.5	22.5	25
	Rainfall	0	0	0
	Relative humidity	49	53	47
	Wind speed	3.6	11.7	7.2
	Modified Nesterov index	1,356	2,500	1,568
	Number of fires	2	0	4
Low (27/03/2009)	Temperature	23.6	22.1	26.6
	Rainfall	13.57	10	24.53
	Relative humidity	71	73.3	59
	Wind speed	1.33	9	9
	Modified Nesterov index	0	31	0
	Number of fires	1	0	0

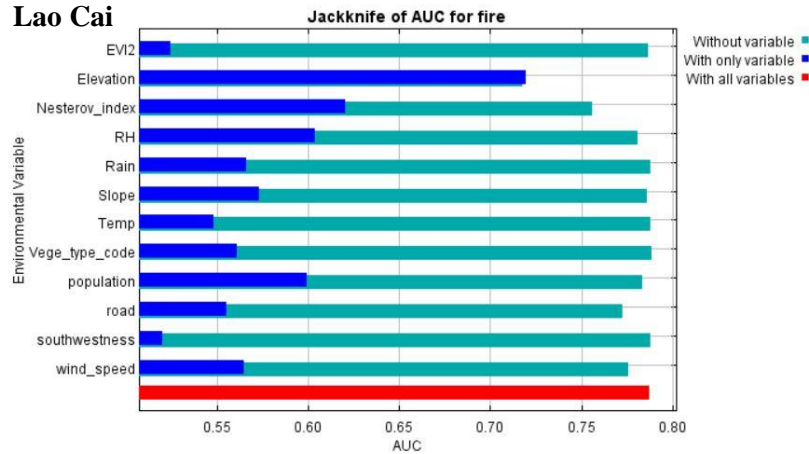
### Combined provinces



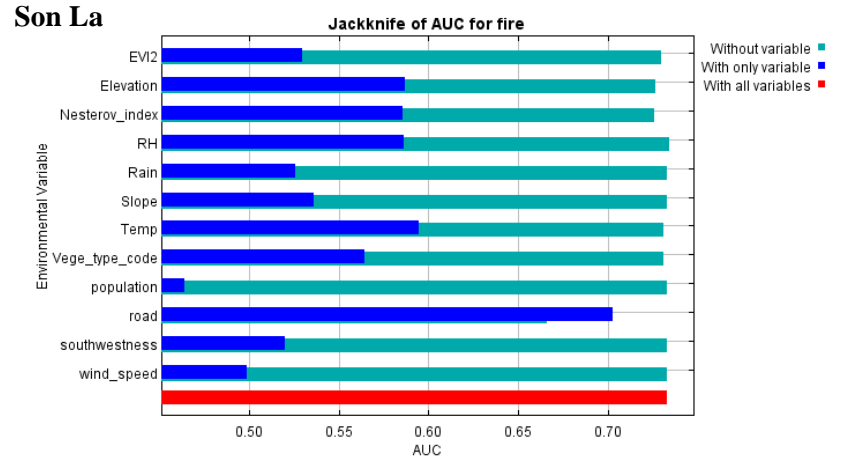
### Dien Bien



### Lao Cai



### Son La



**Supplementary Figure 1.** The relative contribution of explanatory variables to the best fit model for each province (and combined provinces) according to AUC (Area under curve of the sensitivity vs. 1-Specificity plot) codes for variables are as given in Table 1.