PROTECTING CULTURAL HERITAGE FROM WILDFIRES
A NEURAL NETWORK APPROACH

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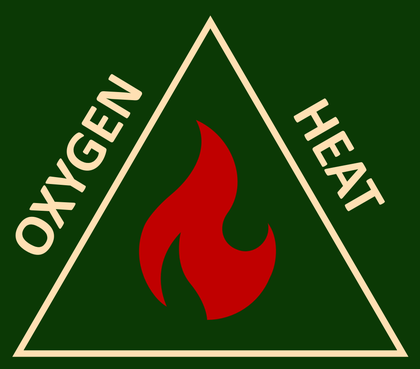
Introduction

The majority of cultural assets and archaeological sites are located in open sunlit regions that due to the large space occupied, are often left **unprotected** from natural hazards such as wildfires.

Towards the end of protecting Heritage, Data Mining methods can be used to extract information from a dataset and transform it into an understandable structure, which can **contribute** in the protection of Cultural Heritage sites.

Wildfires

Wildfires usually evolve from small outbreaks of fire therefore, in cases where there is an efficient amount of "fuel" (e.g. pine needles, rubbish etc.) in the nearby area, forest fires can spread rapidly, burning everything that stands in their way. Although, sometimes this may benefit the renewal of biodiversity, usually it causes a negative impact, exacerbating other related environmental problems.



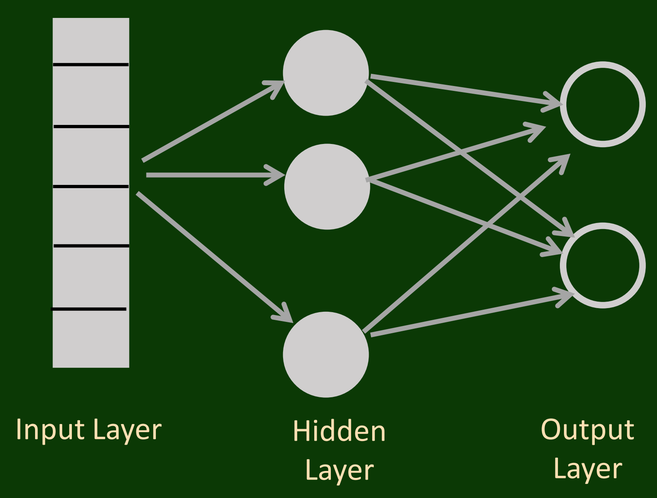
The Fire Triangle

Neural Network

A Radial Basis Function Neural Network (RBFNN) was developed in order to **predict** the appearance of small fires in places of cultural significance.

The proposed network has been tested on the dataset found in UCI Machine Learning Repository for Montesinho Natural Park; a **NATURA** region of Portugal.

Dataset contained 517 entries (e.g. fire indexes, temperature, moisture, wind etc.), which were being processed in the hidden layer of the network in order to estimate the burned area (output).



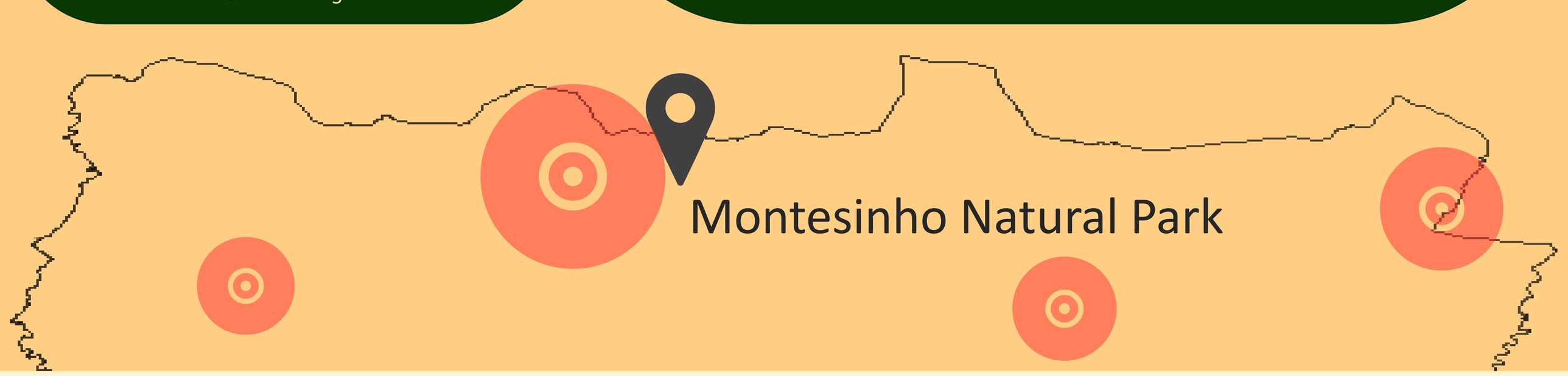
10 Cross Fold Validation RMSE average values for the training data

c	4	6	8	10	11
Proposed Network	**60.9617±6 3.96165**	**59.5916±6 2.57246**	**58.5194±6 3.59162**	**57.3402± 58.5264**	**56.2320± 63.99232**
RBFN1	62.8853±6 2.88525	60.1488±6 2.7569	59.6471±6 2.64714	58.5984± 62.55486	57.5549± 61.44886
RBFN2	62.8523±6 2.85226	60.0430±6 2.2538	59.3951±6 2.39507	58.4039± 62.2564	57.2564± 62.8437
RBFN3	62.8952±6 2.8965	60.1154±6 1.7891	59.6154±6 0.1123	58.5360± 61.2056	57.4747± 62.4491
RBFN4	62.8949±6 3.2489	60.1101±6 2.1781	59.6148±6 2.5715	58.5401± 61.8523	57.4735± 62.9862

10 Cross Fold Validation RMSE average values for the test data

c	4	6	8	10	11
Proposed Network	**38.5473±38. 04731**	**38.2454± 38.51254**	**37.2252± 38.24935**	**36.2342± 38.34585**	**36.1092± 38.64894**
RBFN1	42.2604±42. 26043	41.6319± 42.63194	40.9278± 42.92776	40.1166± 43.22181	39.2218± 42.97561
RBFN2	42.7959±42. 79587	41.9321± 41.85741	40.8836± 44.88364	40.3393± 44.95731	39.9573± 45,02591
RBFN3	42.2705±43. 12594	41.5502± 43.14681	40.3675± 42.02462	39.5308± 42.41681	38.5913± 41.10369
RBFN4	42.2967±42. 35791	41.6643± 43.47123	40.1673± 42.1289	39.5378± 41.93145	38.7791± 41.25481

- The data was split into 60% training data and 40% test data.
- The RBFNN was compared to 4 others, where it yielded better results (lower values of the RMSE confirm both its accuracy and validity).
- Achievement of an efficient fire management algorithmic system for areas of important cultural significance.



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