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FINDING THE PEACEFUL COEXISTENCE OF WILDLIFE AND SALT LICKS USING MACHINE LEARNING FOR ROYAL BELUM RAINFOREST CONSERVATION

By

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Royal Belum Rainforest was gazetted as the Royal Belum State Park on 3 May 2007 and is operated by Perak State Park Corporation. Located in the Perak state of Peninsular Malaysia, the Royal Belum Rainforest with an area of 117,500 ha, is part of the even bigger Belum-Temenggor Forest Complex. Geographically, about 57% of the Royal Belum Rainforest is in the range of 80-300m above sea level, and another 41% in the range of 300-1500 m above sea level. Dating back over 130 million years, the Royal Belum Rainforest is one of the world's oldest rainforests, older than the Amazon Rainforest (South America) and Congo Rainforest (Africa). Within the Royal Belum Rainforest, lies Lake Temenggor, the second largest man-made freshwater lake in Peninsular Malaysia, covering 15,200 ha with hundreds of islands.

It was created after the construction of the Temenggor Dam to generate hydroelectric power and is rich with a variety of precious freshwater fish species such as toman, sebarau, tenggalan, baung, and kelah.



Figure 1: The gateway to the Royal Belum State Park is the public jetty at Banding Island where researchers take the boat to their field site. (Source: Author's personal collection)

The Royal Belum Rainforest is a beautiful sanctuary filled with a variety of flora and fauna. This forest supports a high concentration of wildlife, such as Asian elephants (*Elephas maximus*), Malayan tapirs (*Tapirus indicus*), Malayan tigers (*Panthera tigris*) and all 10 of the Malaysian hornbill species. A total of 80 species of mammals, 67 species of snakes, 97 species of moths, 41 species of dragonflies, 132 species of beetles, 374 species of flowering plants, 89 species of mosses, and 48 taxa of ferns can be found in the Royal Belum Rainforest. This pristine ecosystem has long piqued the interest of many because it conceals a fascinating secret: the unexplained affinity that animals have for salt licks. This article explores the interaction between wildlife and salt licks in the Royal Belum Rainforest and how cutting-edge machine learning technology helps to preserve this priceless habitat.

Mineral licks, commonly referred to as salt licks, are naturally occurring mineral deposits that are highly alluring to a variety of animals. These mineral-rich areas have developed into the social hub for wildlife activity in the Royal Belum Rainforest. Animals frequently congregate in these locations to consume vital minerals like salt, calcium, magnesium, and potassium that are frequently in short supply in their regular diets, including Asian elephants, tapirs, and deers. These sites become places where animals interact, communicate, and establish social hierarchies. Furthermore, predatory animals are drawn to salt licks, providing researchers with a concentrated area for observing animal behaviour. Salt licks are determinants of herbivore density, which in turn influences the distribution of predators. However, there are man-made (artificial) salt licks to further accommodate the shortage of mineral diets.



Figure 2: Sira Batu Natural Mineral Salt Lick at Sungai Papan, Royal Belum Rainforest. (Source: Author's personal collection)



Figure 3: Artificial Mineral Salt Lick at Royal Belum Rainforest (Source: Author's personal collection)



Figure 4: Images captured of red muntjac deers, and Malayan tapirs at the natural mineral salt lick. (Source: Author's personal collection)

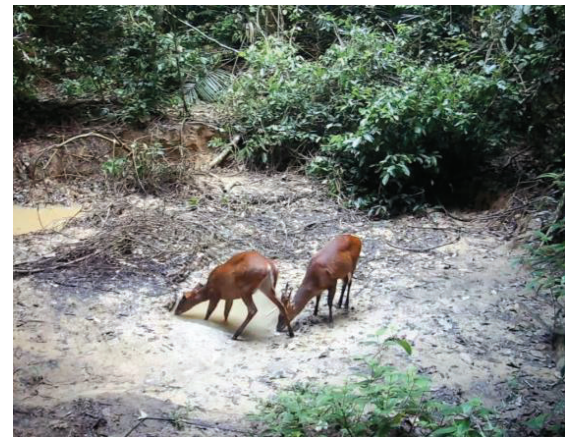


Figure 5: Images captured of red muntjac deers, and Malayan tapirs at the artificial mineral salt lick. (Source: Author's personal collection)

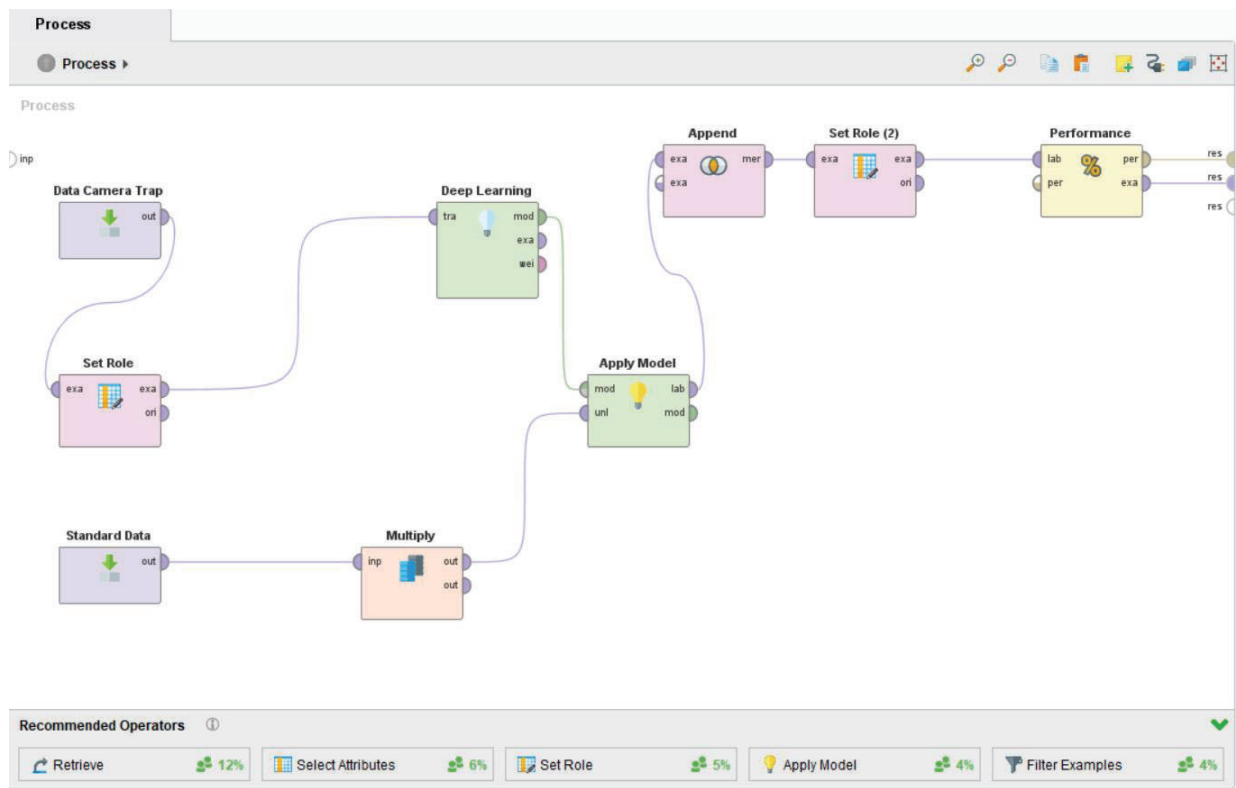


Figure 6: Precision Biodiversity using a machine learning algorithm. (Source: Author's personal collection)

Scientists have long been intrigued by the relationship between wildlife and salt licks, but it was difficult to determine the full scope of this occurrence in the enormous Royal Belum Rainforest. However, new developments in technology have fundamentally changed how researchers approach their work.

Camera traps record unguarded animal moments when they are positioned strategically close to salt licks. Machine-learning algorithms quickly sort through the data and identify the species present in each frame after these photographs have been acquired. This has improved data quality and reliability for researchers by speeding up the identification process and lowering the margin of error.

The application of machine learning technology has been one of the game-changers in the field of wildlife study. Researchers are now able to handle massive amounts of data quickly and easily, including camera trap photos and auditory recordings, to quickly identify and categorize the numerous species that frequent the salt licks. This is made possible by artificial intelligence (AI) and machine-learning algorithms such as RapidMiner or Phyton. This is among various algorithms for Precision Biodiversity as shown in Figure 6.

Beyond simple animal identification, machine learning and wildlife studies complement one another. It is crucial to the forest's conservation efforts. Machine learning data collection offers vital insights into the population dynamics, migrations, and habitat preferences of numerous species and other ecological studies.

Traditionally, wildlife experts would laboriously and tediously spend endless hours combing over photos and comparing them to recognized species. Machine-learning algorithms are now capable of identifying different animal species based on their distinctive traits, such as patterns, colours, shapes, and sizes. This is the result of the wildlife databases on which they have been trained.

Such knowledge is crucial for developing successful conservation measures. These efforts are to safeguard sensitive regions, avoid habitat fragmentation, and resolve human-wildlife conflicts by understanding the patterns of animal behaviour and how they use their habitat.

Additionally, this technology supports the monitoring of threatened and endangered species, enabling us to monitor population patterns and evaluate the success of conservation efforts over time.

Although the Royal Belum Rainforest's wildlife conservation and research efforts in machine learning are still in the early stage, it is important to realize that these developments are not without challenges. First and foremost, significant resources and knowledge are needed for maintaining and implementing the required technologies. To overcome these challenges, partnerships between research institutions, conservation organizations, and technological corporations are essential.



Figure 7: Camera trap Installation. (Source: Author's personal collection)



Figure 8: Dialogue session with stakeholders. (Source: Author's personal collection)

The human element is still a key component of conservation efforts. The preservation of the Royal Belum Rainforest is greatly aided by the local communities. Gaining the support and cooperation of these communities demands a greater understanding of the significance of maintaining the rainforest and its species.

The unique interaction between animals and salt licks becomes noticeable as we continue to learn more about the Royal Belum Rainforest, which serves as evidence of the complex web of life that exists inside this priceless ecosystem. Research on wildlife and rainforest preservation would surely reach new heights as a result of the use of machine-learning technology, enabling us to better safeguard this biodiversity.

As we marvel at the miracles of technology, let's not forget how crucial it is for people to work together and be dedicated to preserving the Royal Belum Rainforest for future generations. Together, we can ensure the rainforest's life thrives and the attractiveness of salt licks remains undiminished.

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