Machine Learning-Optimized Filters for Wireless, Low-Error Networks

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Recent advancements in Cloud Computing have given more flexibility to services on the Internet, remaining online as long as the network itself is still operational. However, many types of natural and man-made disasters can significantly damage existing infrastructure, potentially leaving thousands without adequate access. In previous work, a low-cost, automatically realigning, wireless Free Space Optical Communications (FSOC) system was developed. Arduino Unos sent information by flashing handheld laser diodes, receiving information from an array of photodiodes. For this current project, each device was upgraded by changing to Arduino Dues and redesigning the Printed Circuit Board, gear mechanism, and enclosure. A Machine Learning-based error correction system was then designed and implemented, which used Manchester Encoding and a restricted character set to detect and automatically correct trivial errors. Sending the information to a connected computer, remaining erroneous characters are then pushed through a Java-based Machine Learning algorithm before being shown to the user. Testing has shown this system to be highly effective in correcting errors within messages that used words trained with the algorithm, increasing the viability of FSOC technology to quickly reestablish networks in disaster relief scenarios.

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