

Automatically identifying patterns and novel behaviours in the radio-frequency environment at DRAO

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The Dominion Radio Astrophysical Observatory (DRAO) operations group has decades of experience monitoring the radio astronomy protected bands near 408 MHz and 1420 MHz for man-made interference. New telescopes like CHIME (the Canadian Hydrogen Intensity Mapping Experiment) and projects coming online in 2019 and beyond require the observatory to maintain a clean spectrum (to the extent possible) from 400 MHz to 2 GHz. Although some protection from terrestrial signals is afforded by the hills and low population density surrounding the site, many sources of man-made interference can be observed at the site outside the protected bands. A variety of commercial electrical equipment is operated at the observatory and the telescopes are susceptible to any interference this equipment generates if it is not adequately shielded. Previous attempts at interference monitoring at DRAO have been limited to surveys covering a specific time range or instruments, which have produced more data than could be digested by limited personnel resources. To assist with the day-to-day maintenance of the site we require a tool that can digest the volume of data produced by a site interference monitor in an automated fashion. It should provide:

1. A continuous and detailed characterization of the wideband radio frequency “scene” at the site, considering features of each transmission: centre frequency, bandwidth, duration, time of day, received power, channel parameters, modulation parameters, etc.;
2. The ability to recognize patterns in the data: similarity in temporal structures, modulation formats, etc. across the frequency axis;
3. Automated and near real-time alerting of new behaviours observed at the site: changes in temporal patterns, power levels, new signals, etc.;
4. The ability to store this information in a database for further exploration and analysis.

Such a tool would allow the operations group to expand greatly the site monitoring program without expanding personnel resources, and help to ensure that the DRAO site remains a great asset to the Canadian astronomy community.