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Characterising matroids representable over all fields of size at least four

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A matroid is regular if it is representable over every field. Characterisations of regular matroids are known (Tutte, 1958) in terms of excluded minors, having a totally unimodular representation, and representability over GF(2) and some field of characteristic not two. A matroid is near-regular if it is representable over every field of size at least three. Characterisations of near-regular matroids are known in terms of excluded minors (Hall, Mayhew, van Zwam, 2011), having a near-unimodular representation, and representability over each of {GF(3),GF(8)}, or each of {GF(3),GF(4),GF(5)} (Whittle 1997). In this talk, we consider matroids representable over all fields of size at least four. None of these three types of characterisation are known for this class, but I'll discuss some partial progress for each, and some related open problems. This will include joint work with James Oxley, Charles Semple, and Geoff Whittle; Rudi Pendavingh; and Rutger Campbell.

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